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A SURVEY OF TUBERCULOSIS OF BOVINE ORIGIN IN GREAT BRITAIN*

No section of the community has more clearly recognised or more steadily stressed the importance of tuberculosis of bovine origin to the health of the human population of this country than has the veterinary profession. All too often, however, kinetic enthusiasm has been effectively countered by the demand for statistical proof of the force of contentions as to the necessity for administrative action. In point of fact, both anti-tuberculosis progress along public health lines and the "drink more milk" campaign have suffered obstruction from the welter of surmise as to incidence in which the problem has been immersed, and that not alone in the public mind.

It was therefore with relief and good-will that British veterinarians learned of the successful effort made by Miss Olga Nethersole, Founder and Hon. Organiser of the People's League of Health, to induce her powerful organisation (1) to undertake the statistical study of tuberculosis of bovine origin, which was essential if any scientifically and economically sound policy were to be initiated, and (2) to endeavour to arrive at some considered opinion regarding the sources and treatment of this form of tuberculosis, and to suggest methods that might be employed for its prevention and eradication. The coöperation of the profession was readily forthcoming, several prominent members accepting service on the Special Committee formed in February, 1930, to undertake the survey.

The following summary of the subject-matters adopted for investigation is indicative of the comprehensive nature of the enquiry.

A. BOVINE TUBERCULOSIS.
   Amount of tuberculosis in dairy stock as judged by:—
   1. Reactors to tuberculin.
   2. Udder cases.
   3. "Open cases."

B. HUMAN TUBERCULOSIS OF BOVINE ORIGIN.
   Its amount, incidence, spread, lesions, and the vehicles of its transmission.

C. THE SPREAD OF BOVINE TUBERCULOSIS.
   Its methods of transmission.
   Factors affecting infection.
   Natural history of tuberculosis in bovine animals.

D. METHODS EMPLOYED TO REDUCE BOVINE TUBERCULOSIS, WITH EVIDENCE AS TO THEIR EFFECTS.
   1. Building up of tuberculosis-free herds.
   2. Elimination of all tuberculous animals.
   3. Education and more hygienic environment.
   4. Operation of the Tuberculosis Order.
   5. Immunization.

E. METHODS NOW EMPLOYED TO REDUCE THE RISK OF TRANSMISSION OF TUBERCULOSIS BY MILK, WITH EVIDENCE AS TO THEIR SUCCESS.
   1. "Designated milks."
   2. Operation of the Tuberculosis Order (1925).
   3. Systematic veterinary inspection of cows.
   4. Bacteriological control.
   5. Pasteurisation.

F. EXECUTIVE LEGISLATION AND ADMINISTRATIVE MEASURES AND THEIR RESULTS.
   Suggestions as to lines of advance, legislative and otherwise, and the formation of a scheme for the eradication of tuberculosis conveyed by milk.

The foregoing subjects were finally referred to two Sub-Committees known, thereafter, respectively as "A and B" and "C," which then entered upon their deliberations.

Sub-Committee A and B directed its attention to the statistical data as specified under heads A, B and C, in the scheme given above.

Sub-Committee C directed its attention to the subjects designated under D and E.

The subject matters under F were reserved for the final consideration of the General Committee after the reports of the Sub-Committees had been received.

REPORT OF SUB-COMMITTEE "A AND B"

At the commencement of their report this Sub-Committee, over which Dr. William Hunter presided, introduce a table detailing the total bovine population of England and Wales on June 4th, 1929 (total 5,957,594), in order to show the magnitude of the bovine tuberculosis problem in England and Wales. The well-known findings of the results of the investigations by Mr. H. G. Sanders and Mr. G. H. Garrod (amongst others) into the milking life of cows, follow, the average duration being between 4½ and 5 years.

*Report of a Special Committee appointed by The People's League of Health Inc. Issued March, 1932. Obtainable from The People's League of Health, 12, Stratford Place, London, W.1. Price 1s. 6d. (Postage extra, 1½d.).

DEPT. OF VET. MEDICINE

Attention is next devoted to the incidence of bovine tuberculosis as estimated from the results of tuberculin tests. Tabulated results of testing are given from various reliable sources, the average of the figures available being about 40 per cent., which is to be regarded as a conservative estimate of the amount of tuberculosis in dairy cattle, and constitutes an incidence which obviously renders it "futile to recommend the immediate elimination of all reactors irrespective of whether or not they were giving tuberculous milk." In this connection, reference is made to the enviable position of the United States, where the low initial incidence made practicable the adoption of the policy of slaughtering all the reactors in the country, and where the precentage of reactors dropped in ten years from 4·1 (1919) to 1·8 (1929).

In Great Britain, then, particular importance attaches to the incidence of udder tuberculosis, and here the findings of routine inspections of cows by veterinary officers furnish a useful guide, since special attention is invariably paid to the condition of the udder. Returns from Lanarkshire, the West Riding and Cumberland are given; they are reasonably consistent and show that about 0·13 per cent. of cows when inspected yield evidence of mammary infection with tubercle, detectable by clinical examination supplemented by some assistance from bacteriological examination of the milk. With more frequent examinations, such as are possible in city cowsheds, rather higher figures may be recorded, and when allowance is made for undetectable cases (*i.e.*, cows examined at the stage when no clinical signs are present, although tubercle bacilli are excreted in the milk) the percentage may be taken as about 0·2 for the country generally.

Statistics derived from abattoir examinations (City of London, Edinburgh, Newcastle-on-Tyne) show that, of 55,318 cows slaughtered, 39·5 per cent. were found on *post-mortem* to contain gross macroscopic lesions of tuberculosis, but it is pointed out that abattoir figures concern, as a rule, the older animals and that, as is well known, the incidence of tuberculosis in bovines increases with their age.

Concerning the evidence of the presence of tubercle bacilli in milk, the Sub-Committee examined the reports of a number of milk samples taken under the provisions of the Milk and Dairies Act, and also those recorded by the Ministry of Health, and some of these are given. Taking all the quoted figures together, the results are as follow: —

No. of Samples Examined.	No. containing Tubercle bacilli.	Percentage containing Tubercle bacilli.
69,901	4,690	6·7

No obvious reduction in the proportion of milk infected with tubercle bacilli has occurred during the last ten years; and examination of figures referring to an earlier period (1908-1910) likewise lends no support to the idea that any marked general improvement in the milk supply, so far as its freedom from infection with tubercle bacilli is concerned, has taken place.

INCIDENCE OF TUBERCULOSIS OF BOVINE ORIGIN IN HUMAN BEINGS

In this outstandingly important section of the Sub-Committee's report, it is recalled that, of the four types of tubercle bacilli—the cold-blooded, avian, bovine and human—the last two are incriminated in the infection of man: his infection with the avian type is so rare that it can be disregarded. The facts—well-known to our readers—of the pathogenicity of the respective types in their various hosts are recounted, as are those relative to the paths of infection. The alimentary tract is the route of infection of man with the bovine type, from both milk and meat; although there is every reason to believe that, under modern hygienic conditions, the risk of infection of man from tuberculous meat is almost negligible, compared with that from infected milk. Milk is consumed daily mainly by the young, and the maximum incidence of tuberculosis of bovine origin is in childhood: indeed, about two-thirds of the deaths due to bovine infection occur before the age of fifteen years. This is shown in the following table, from which it will be noted that the calculated bovine (type) deaths in 1928 from all forms of tuberculosis were approximately 2,000; that 5·3 per cent. of all deaths were due to the bovine type, and that 23·6 per cent. of the non-pulmonary deaths were due to this type.

BOVINE TUBERCULOSIS DEATHS IN ENGLAND AND WALES, 1928, SUMMARISED. ALL AGES.

	Deaths.	% *Bovine.*	*Bovine Deaths.*
Respiratory ...	29,799	1·06	316
Nervous ...	2,551	21·40	546
Abdominal ...	1,336	52·46	701
Bones and Joints	793	6·43	51
Skin	79	10·0	8
Lymphatic Glands	90	40·0	36
Genito-urinary	291	15·81	46
Disseminated ..	1,668	13·49	225
Other Organs ...	16	8·0	1
All Forms ...	36,623	5·27	1930
Tuberculosis excluding that of respiratory origin ...	6,824	23·64	1614

BOVINE TUBERCULOSIS DEATHS IN CHILDREN UNDER 15.

	Deaths.	% *Bovine.*	*Bovine Deaths.*
Respiratory ...	1,225	1·5	18
Nervous ...	2,068	22·8	472
Abdominal ...	668	75·0	501

	Deaths.	*% Bovine.*	*Bovine Deaths.*
Bones and Joints	82	22·0	18
Skin	0	0	0
Lymphatic Glands	34	79·4	27
Genito-urinary	13	33·3	4
Disseminated ..	724	24·6	178
Other Organs ...	8	15·0	1
All Forms ...	4,822	25·27	1,219

To show that these figures for 1928 are not exceptional, the calculated deaths of bovine origin for the ten years 1920-29 are set forth in a further table, and it may therefore be concluded that approximately 6 per cent. of all tuberculous deaths are due to infection with the bovine type. In other words, about 2,000 children die annually from tuberculous infection of bovine origin.

In estimating the proportion of bovine infections, it has been assumed that the same proportion holds for cases of illness as for actual deaths. This assumption is not altogether justified, since owing to the peculiar location of many bovine lesions and the usual failure of the lungs to be involved, death is probably less frequent than with infections of the human type. Figures calculated on this basis will, therefore, under-estimate the true frequency of bovine infection, but they do afford some indication of the amount of illness caused by this organism, and from a tabulated statement of the incidence of bovine (type) tuberculosis in England and Wales as measured by notification of cases, 1920-1929, it appears that at least 4,000 fresh cases of infection due to this type must occur annually. Moreover, inasmuch as many cases, particularly those of the non-respiratory type, remain unnotified, 4,000 is undoubtedly again an under-estimate. "Moreover, no mere figures can correctly indicate the extent of suffering and deformity caused by this disease." Figures for Scotland, obtained from an examination of tuberculous lesions, indicate a greater frequency of bovine infection in that country.

There follows a table which shows that the annual death rate from tuberculosis, both of the pulmonary and non-pulmonary type, has diminished considerably during the past eighty years. The latter is much more marked, and in this connection the following factors responsible for the differential fall are mentioned:—

"(*a*) Improvement in the general hygienic production of milk. There is no doubt that during the past ten or twenty years, as a result of the educational work undertaken amongst farmers, of the institution of Clean Milk Competitions, of the introduction of "grading," and of the sustained and praiseworthy efforts, in particular, of the National Institute for Research in Dairying, there has been a marked improvement in the general cleanliness of milk production. Whether there has been any corresponding decrease in the frequency with which milk is infected with tubercle bacilli, it is not possible to say with certainty. Judged from the proportion of samples infected now and twenty years ago, there is little evidence of any improvement, but it must be remembered that the biological test for tubercle bacilli in milk is a qualitative test, and will not reveal, under the conditions in which it is usually performed, any difference in the numbers of tubercle bacilli. It may well be that, even though the proportion of infected samples still remains high, the actual numbers of tubercle bacilli in market milk have actually fallen. This might take place as the result of earlier detection of cases of udder tuberculosis, which would probably result in a decrease in the heaviness of infection before an actual fall in the proportion of infected milks became apparent.

"(*b*) Increase in the pasteurisation and sterilisation of milk. That pasteurisation, if adequately performed, is capable of destroying tubercle bacilli and rendering infected milk safe for consumption, there seems to be very little doubt. Striking evidence of its effect in preventing tuberculosis of bovine origin has recently been collected in Toronto by Price. Material from 207 cases of tuberculosis in children, mostly of non-pulmonary type, was examined, and the bovine type of bacillus was recovered from 26 cases. All the cases infected with the bovine type came from the country around Toronto, where the milk was mostly consumed raw; in Toronto itself, where 99·5 per cent. of all milk sold is pasteurised, not a single case of bovine infection was found."

The extent to which pasteurisation has been responsible for the fall in tuberculosis of bovine origin in this country is described as doubtful. "Seeing that pasteurisation and sterilisation of milk have been operative on a big scale only during the past ten or fifteen years, it is doubtful whether they can be held chiefly responsible for the fairly rapid decline in non-pulmonary tuberculosis that has been going on for the last thirty years. More probably their influence has been to accelerate during recent years a fall which had already commenced as the result of other causes."

"(*c*) Improvement in child welfare. During the past twenty years or so there has been a steady increase in the number of infants and children supervised by welfare centres. At many of these centres, care is taken to provide milk, either derived from safe herds or in a form which renders it probable that any tubercle bacilli have been destroyed. It is not unjustifiable to assume that this action has been in some measure responsible for the marked diminution in tuberculosis of bovine origin which has occurred."

REPORT OF SUB-COMMITTEE "C"

This Sub-Committee, over which Dr. C. O. Hawthorne presided, "being satisfied with the evidence that milk, as at present produced and distributed, is one of the agencies through which tuberculosis is communicated to human beings," concerned itself mainly with the study of methods by which a milk-supply free from the risk of infection by the tubercle bacillus can be secured.

Early disposal is made of the suggestion that a slight infection with the tubercle bacillus in early life has value; even if it be true, the practical lesson is not that immunisation should be left to the chance of a more or less infected milk supply, but that this end should be reached by a

definite and controlled system of prophylactic vaccination or other allied method, and no such system has established itself as yet.

The report stresses what the Sub-Committee regards as a fundamental distinction—that between the subject of the diminution or eradication of tuberculosis in cattle, and that of the provision of a safe milk-supply for human consumption. "The first problem is entirely a veterinary one, and should be dealt with by the Ministry of Agriculture. The second problem is essentially a medical one, and should be dealt with by the Ministry of Health. Nevertheless, measures for dealing with the two problems must overlap to a considerable extent. Hence it is desirable that the Ministry of Health and the Ministry of Agriculture should jointly agree on a plan which would embrace the two problems and lead to the maximum of administrative efficiency."

Regarding measures for diminishing the incidence of tuberculosis in cattle, three groups of procedures are considered and recommended: The first, the prophylactic vaccination of cattle, is at present only in its experimental stages. In regard to the other two measures, "we desire to emphasise the primary importance of our proposals for increasing the number of herds the component animals of which are ascertained to be free, and are maintained free, from any taint of tuberculosis. This appears to us to be the only radical solution of the problem of bovine tuberculosis." Appreciation is expressed, however, of the difficulties of the problem and the fact that progress in this direction must of necessity be slow, and a supplementary group of measures is therefore included, in the belief that the policy outlined for dealing effectively with the recognised infective cases is likely to lead to a diminution in the amount of tuberculous infection amongst cattle and to facilitate the operation of the more thorough scheme.

In the consideration of measures for increasing the number of herds free from tuberculosis, it is recalled that in 1919 the Departmental Committee on the Production and Distribution of Milk recommended that a scheme for assisting owners to build up herds of cattle free from tuberculosis should provide for: (1) "Official veterinary assistance in the work of diagnosis and eradication; (2) the issue of certificates in regard to those herds in which the necessary conditions had not been complied with; (3) correlation with a system of milk grading which could provide an official guarantee, on which a milk producer could base a claim to receive a better price for tubercle-free milk."

In this connection the report comments with some asperity: "The Ministry of Health has provided a system of milk grading since 1922, but no corresponding action has been taken by the Ministry of Agriculture to provide any kind of assistance on the lines above indicated or on any other," while the veterinary profession will give hearty endorsement to the uncompromising declaration that the existing nomenclature applied to graded milks is unsatisfactory, and new terms which carry definite meanings to the public are required.

This very important section of the Survey proceeds: "There is an urgent need for the introduction of such a scheme; and cattle breeders throughout the country would welcome some indication that the Authorities intend to assist them in the matter. The building up of tuberculin-tested herds, and the establishment of 'accredited' areas have proved of great value in Canada and the United States of America, and though the problem on the other side of the Atlantic is in many ways simpler than it is in this country, the Sub-Committee is strongly of opinion that this policy is to be recommended as affording the most fruitful method of bringing about the ultimate eradication of tuberculosis from cattle.

"It is not the desire of the Sub-Committee to recommend any scheme in detail for accomplishing this end. In recent years, schemes have been drawn up by the Scottish Conference on Agricultural Policy (1925), by the Scottish Branch of the National Veterinary Medical Association (1930), and by the National Veterinary Medical Association of Great Britain and Ireland (1931).

"In particular, the Sub-Committee would emphasise the importance of the following points: (*a*) Tuberculin, in order to ensure adequate potency and reliability, should be standardised, and its distribution and use should be regulated as in the case of substances included in the 'Dangerous Drugs Act'; (*b*) the methods adopted for the carrying out of the tuberculin tests should be standardised; (*c*) an official register of tubercle-free or 'accredited' herds should be instituted for herds which comply with the necessary conditions (including periodical testing) of a national scheme; and owners of herds entered in this register should be allowed to use an appropriate designation.

"For the full development of any such scheme, it will obviously be necessary to secure the active coöperation of the agricultural interests."

Consideration is next devoted to measures for the detection and elimination of "open" cases of tuberculosis, which is the main object of the Tuberculosis Order of 1925 issued by the Ministry of Agriculture, and which, according to the circular issued with it, "aims at the destruction of every cow suffering from tuberculosis of the udder or giving tuberculous milk, and every bovine animal suffering from tuberculous emaciation or suffering from a chronic cough and showing definite clinical signs of tuberculosis." Following a reference to provision for notification, the report observes: "This Order has now been in operation for more than five years, and although considerable numbers of animals are reported and dealt with annually, the opinion

is generally held that no appreciable progress has been made towards the eradication of the actual numbers of 'open' cases. The main cause of this comparative failure is that the vast majority of the cattle slaughtered under the Order have acted as centres of infection for a considerable time before they were reported. No real progress can be expected until a scheme is devised and brought into action which will enlist the coöperation of the herd owner, the Local Authority, the veterinary inspector, and the bacteriologist in discovering and dealing adequately with infected 'open' cases at the earliest possible moment.

"An amplification of the Tuberculosis Order, 1925, or a new scheme with these objects in view, should deal specifically, amongst other points, with the following: (*a*) Owners of stock to notify suspected cases immediately; (*b*) Local Authorities to appoint experienced and preferably full-time veterinary inspectors to visit and report on all such infected cases, to take samples of milk for bacteriological examination, to apply such tuberculin tests as may be considered advisable, to see that such suspected animals are isolated from other stocks, that the milk is treated as directed, and that disinfection of premises occupied by infected stock is properly carried out; (*c*) compensation payable to the owner to be so arranged and graduated as to encourage the immediate notification of suspected cases and to penalise any undue delay; no compensation should be paid for animals which should clearly have been reported at an earlier stage of the disease; (*d*) since adequate isolation is often impossible on small farms, to enable infected animals to be isolated and controlled, Local Authorities should be empowered to establish isolation centres for the housing of infected animals; animals removed to such centres could be valued before removal, and compensation paid on the lines indicated above; (*e*) Local Authorities to adopt and pursue a definite system of bulk milk sampling and bacteriological examination as a means of discovering herds or groups of animals containing 'open' cases; (*f*) the licensee of any premises registered for the slaughter of animals should be compelled to keep a register, open to inspection by the proper officers, for all their purchases, showing where obtained, from whom, and when."

It is pointed out that the development and operation of such a scheme requires the goodwill of the farmer; and that, to assist in creating this attitude of mind, an educational campaign will be necessary to explain more fully to farmers the advantages of discovering suspicious cases at as early a stage as possible, and of recognising the importance of sound methods of housing, feeding, and management, and of adequate disinfection of premises occupied by infected stock. In this aspect of the work material assistance could be rendered by veterinary inspectors.

The extension proposed is, it is claimed, of particular value in that it is along lines already in force and would be useful as a measure preliminary to the application of any comprehensive scheme, but these measures can only be supplementary to those previously outlined by the Sub-Committee as an essential basis of any effective scheme to eliminate bovine tuberculosis.

While recognising the value of routine clinical examination of all dairy cows in detecting tuberculosis of the udder, the Sub-Committee realises that it does not reduce the amount of tuberculosis in cattle to the extent that can be obtained by other methods, which should be adopted in preference if financial considerations necessitate a choice. Under more favourable financial circumstances, however, there would be welcomed an extension of veterinary inspection in association with a more certain method of eradicating tuberculosis, since such a combination of methods would not only effect a very material reduction in the disease, but would also assist the dairy farmers to eliminate many other diseases from their herds.

In a brief reference the importance is stressed of devoting greater care than has hitherto been bestowed upon it in this country, to the investigation of the various vaccines available for the study of immunological prophylaxis in bovines.

In its consideration of measures for providing a safe milk supply for human consumption, this Sub-Committee, too, rules out the wholesale slaughter of reacting cows as an impracticable policy; nevertheless, the principle of a milk-supply obtained from non-tuberculous cows has been accepted and approved by the Ministry of Health in the Milk Designations Order. During recent years there has been a slow but steady increase in the supply of milk from herds free from tuberculosis as recognised by the Ministry of Health under the Milk (Special Designations) Order, 1923. In order to encourage this supply, the Sub-Committee recommends that the operation of the Order should be modified as follows: (*a*) To the different grades of designated milks new terms or names should be given which would indicate definitely to the purchaser the nature and quality of each grade; (*b*) the fee required by the authorities for a licence to produce designated milks should be abolished; (*c*) the system whereby licences under the Milk (Special Designations) Order are granted should be simplified by a reduction in the number of licensing authorities.

At present, however, the number of herds producing tubercle-free milk is so few that it is impossible to supply more than a very small proportion of the population with such milk, and while an increase in these herds is earnestly to be hoped for, "the problem to be faced at the moment is the provision of a safe milk supply to the whole population." The immediate necessity is to prevent the occurrence of the large number of cases of bovine tuberculosis due to

the consumption of infected milk, and " in view of the gravity of this problem, we are of opinion that all raw milk for human consumption that does not come from tuberculin-tested herds should be adequately pasteurised; or, if this is impossible, should be sterilised or boiled."

Short of the attainment of the highest level, *i.e.*, an absolutely tubercle-free herd, much can be done at the source to avoid infection of milk with the bacillus: one obvious aid to safety is the tuberculin-testing of any animal before its admission to the herd.

Finally, " the Sub-Committee is of opinion that the Ministry of Health should draw up Milk Regulations, which, with the approval of the Minister, could be adopted by any of the larger Local Urban Authorities, and that these Regulations should include the following: (*a*) To require that all milk sold within the jurisdiction of the Authority should either be from herds in which no animal reacts to the proper application of the tuberculin test, or has been effectively pasteurised; (*b*) to forbid the importation into the area of milk which has been treated by heat other than by the process of pasteurisation as prescribed by the Minister of Health, and to require that any milk that has been pasteurised shall be so described when offered for sale; (*c*) that there should be compulsory classification of all grades of milk sold within the area in accordance with the terms of the Milk Designations Order in force for the time being; and (*d*) that adequate supervision and control over the health of all persons engaged in the production and distribution of milk should be secured.

" Before such powers are granted to any Local Authority, an enquiry into the condition of milk production and distribution in its area should be undertaken by the Ministry of Health to ensure that the proposed regulations are suitable to the local conditions."

The findings summarised in the foregoing reports, representing as they do the results of the careful work over one-and-a-half years of a representative body of experts of unimpeachable authority, furnish (1) invaluable data which may be accepted with confidence as an accurate statement of the existing position; (2) a well-informed subsequent assessment of the relative utility of various proposed procedures; and (3) a coherent scheme for the reduction and eventual elimination of the danger of tuberculosis being spread through the agency of the milk supply.

The report demonstrates that the Special Committee of the People's League of Health have achieved an outstanding measure of success in the formidable task of making a survey of tuberculosis of bovine origin in Great Britain. At long last, in place of the widespread vagueness of assumption hitherto prevalent in this literally-vital field, we have a readily-available compendium of knowledge. While the immediate usefulness of this report will be evident to all associated, in any capacity or degree, with its subject, the assessment of its full value, and of the consequent indebtedness of the community to those concerned with its compilation, must await the harvest of enhanced communal good health which will surely spring from the seeds of suggestion sown in the ground covered by the survey. W. B.

ELECTRICITY FOR THE SLAUGHTER OF ANIMALS

D. J. ANTHONY, M.R.C.V.S., D.V.S.M.

For some 30 years scientists have experimented with electricity in order to produce a state of anæsthesia in animals and man, and in recent years electricity has been applied to the food animals in order to render them unconscious before slaughtering. Most of the work in this connection has been done in Germany, France, Holland, and the United States of America. The German method is the one invented by Professor Muller of the Veterinary College at Munich, and Herr Weinberger, and it is the latest improvement on this method which has now been introduced into this country by the General Radiological and Surgical Apparatus Company of Great Portland Street, London, and which is known as " The S.R.V. Electrolethaler No. 2." The claims made on behalf of this latest device are that it is humane, instantaneous in action, economic in use, causing no " splashing," in the meat, is safe, and ensures complete bleeding.

HISTORICAL OUTLINE

Before discussing the suitability of the S.R.V. Electrolethaler No. 2 for the slaughtering of animals for human food, it may be interesting to give a brief account of the history of electricity in the slaughtering of animals in Great Britain. The first demonstration of the " Muller-Weinberger " method was held at the instigation of Mr. A. E. Marsh, the head of a firm controlling a large number of bacon factories in this country, at the factory of Messrs. C. & T. Harris of Calne, Wiltshire, in 1929. Herr Weinberger, one of the joint inventors, was present and personally carried out the stunning which was witnessed by the firm's veterinary officer, Mr. C. H. Ducksbury, as well as by myself and others. This demonstration was reported upon in the *Veterinary Record* (1929, ix, p. 433). It was an earlier and much cruder method than the one now in use and to be described here, and without going into detail it may suffice if I state that the damage to the flesh and bones in the carcasses was so great and easily apparent that, after carrying out numerous tests, we were forced to conclude that the method in its stage of development at

that time, was unsuitable for adoption by bacon curers in this country.

The early experiments carried out in Chicago fully confirmed and supported our conclusions, as the American investigators also found the method to cause great damage to the flesh and bones of the carcasses.

Since 1929 a vast amount of work has been done on electricity in the slaughtering of animals, and electric instruments for this purpose have been in regular use at various centres in Germany, Austria, Czecho-Slovakia, Holland, Denmark, Sweden, U.S.A., China and Japan. Although I have not witnessed the "Gjerstrup," or Dutch method, in use, from photographs it would appear to be somewhat similar to the Muller method, but I am not aware of the type of current applied. In the U.S.A., it is the German method which is chiefly used.

Late in 1931, Herr Weinberger gave a demonstration on pigs at the Brierley Hill Factory of Messrs. Marsh & Baxter, Ltd., with the Electrolethaler No. 2, and as a result an instrument was installed for use on pigs, including sows, and this has been in regular use since, about 15,000 pigs having been stunned by this instrument to date.

THE INSTRUMENT

The S.R.V. Electrolethaler No. 2 is in the form of a large "tongs," the handles being well insulated and connected by cables to a transformer which converts an ordinary current of about 200 to 220 volts down to between 40 and 70 volts. A "press-button" switch is fixed into the right handle of the instrument in a convenient place for the operator's thumb to rest upon it. The electrodes at the ends of the tongs have spongy pads fixed between some metal spikes, these pads being dipped in 20 per cent. saline solution before each application. (In the instrument installed here, the metal spikes were made slightly longer than those found in the ordinary Electrolethaler No. 2, owing to the necessity of using the instrument on sows, etc.) The instructions issued with the Electrolethaler state that the instrument should be applied behind the animal's ears and the current switched on for a few seconds. When the animal falls to the ground the current may be switched off and the tongs placed with one electrode on the pig's forehead, and the other behind the ear, the current being switched on a second time for a few seconds longer, making a total current application of about 10 to 15 seconds in all.

In our first experiments here, and until the operator became familiar with his instrument, we gave the pigs about 20 to 30 seconds application of current, and found that by doing so a number of pigs' carcasses had either the fourth, fifth, sixth or seventh dorsal vertebræ fractured, whilst some had fractured scapulæ, the fractures being usually in one vertebral body only, and in both scapulæ in the one pig, the scapular fractures being at the "neck" of the bone in every case, with blood extravasation into the surrounding muscles at the shoulder joint. About 5 per cent. such cases occurred, whilst the rate of killing was also slowed down considerably.

We then set to work to remedy these ill-effects. The rate of killing improved as the operator became familiar with the use of the instrument and was able to ascertain that the pigs could be effectively stunned with from 10 to 15 seconds application of current, and in some cases even less than 10 seconds, depending upon the type of animal, size, age, and thickness of the bristles (the almost bald "Ulster" pig requiring very little application of current). About five or seven seconds per pig constitutes our present rate. The fractured bones were believed to be due to the sudden contraction of muscles when the current was first applied, and it was thought that by following the instructions, *i.e.*, applying the current for only a few seconds at first behind the pig's ears, then when the animal fell to the ground, re-applying the current to the forehead and back of the ear, two violent contractions of muscles were caused, as they became relaxed when the current was switched off. Our first step in the elimination of bone fractures was to apply the tongs immediately behind or on the animal's ears, and to keep them there for the full period of 10 to 15 seconds required to render the animal unconscious, thus causing only one initial violent contraction of muscles instead of two. The result was a drop in the number of cases of fractured shoulder-blades from 5 per cent. to a mere fraction of 1 per cent. of the pigs killed. It is therefore necessary to warn anyone intending to use this instrument to produce anæsthesia for minor surgery, that there is always the possibility of bone fracture occurring.

In view of our experience, I would suggest to the makers of the Electrolethaler No. 2, that they modify their instructions for use, making one application of current suffice instead of two.

EFFECT OF ELECTRIC CURRENT ON THE PIGS

Immediately the current is switched on, the pig closes its eyes and tilts the head upwards; the forelegs become stiff and extended, the hind limbs contracted, the animal going into a sitting position, then falling over on its side to the floor. If the hand is placed anywhere on the animal's body at this stage one can feel the trembling of the muscles. The bladder and rectum may be emptied in some cases, and there may follow some reflex movements of the hind limbs, whilst a faint congestion of the skin along the belly

is sometimes noticeable. When the current is switched off, the limbs again relax and the animal can be hoisted for bleeding. The eyes open, the corneal reflex being absent in some cases and present in others. There is a good flow of saliva from the mouth. The animal hangs quite motionless, there is no struggling when being bled, the whole body appearing quite limp. The blood is somewhat darker in colour than normal, whilst the heart and respirations are in action the whole time, the latter being slowed down considerably. Blood flows freely when the animal is "stuck," and can be collected more easily.

Owing the the lack of struggling the blood is not splashed about, thus more blood can be collected from an electrocuted pig than from a " stuck " pig, whilst from tests to be mentioned later it is apparent that the carcasses of electrocuted pigs bleed more effectively than those of " stuck " animals. The dark colour of the blood disappears when it is stirred to prevent clotting, as is usually done if it is to be used for the manufacture of " black puddings." The volume of blood available for such use has increased since the adoption of the Electrolethaler No. 2.

As far as offal is concerned, the lungs and hearts, as well as all the internal organs, are indistinguishable from those taken from the carcasses of pigs bled without stunning. There is no " splashing " visible in the carcasses, the only damage being the cases already mentioned where bones are fractured, but this slight damage is more than offset by the advantages of having pigs slaughtered in silence and without movement on the part of the animal.

EFFECT ON THE CURED PRODUCTS

Certain tests were carried out spectroscopically in order to determine whether meat from electrocuted pigs contained more or less blood colouring matter than that from " stuck " pigs. The result of these tests indicates that the meat from the former contained less blood colouring matter than that from the latter. Similar results were found by Doctors Edington and Elliott at Sheffield (*Veterinary Record*, No. 52, Vol. xi, pp. 1303-4, December 26th, 1931).

Cured bacon from electrocuted pigs is now available for examination. There is no splashing, the curing and colouring being quite good and indistinguishable from bacon produced from pigs bled without stunning. This bacon has been on the market for some weeks now, and no complaints whatsoever have been received from any customers regarding any difference in appearance or taste. Hams are also available, and on examination these prove to be quite good and in no way different from hams derived from " stuck " pigs, although some of the hams from the early experiments, when pigs were given over 15 seconds application of current, tend to have a rather " angry " appearance, the subcutaneous blood-vessels showing up rather prominently in the dried ham. There is no splashing or other injury. Portions of the cured products from electrocuted pigs have been cooked and tasted, and are found to be in no way different from ordinary bacon and ham produced from pigs bled without stunning. It would appear, therefore, that the Electrolethaler No. 2, has no prejudicial effect upon the cured products.

The Use of Electricity for Animals other than Pigs

It was thought that the wool in sheep would interfere with the application of the electric current to those animals, but such was not the case. (I have already pointed out that the instrument used here has slightly longer metal spikes than are ordinarily provided.) Some 1,000 sheep of various breeds have up to the present been effectively stunned by the same instrument used on pigs, an extra plug being fitted to the transformer to carry cables to the sheep slaughtering hall. Messrs. Clark & Tweed (*Veterinary Record*, No. 7, Vol. xii, p. 177, February, 1932) in their report on the use of electricity in the stunning of animals, state that the method is at present only universally applicable to pigs because of the difficulty in other animals of overcoming the resistance of the hair or wool of the pelt. In our first experiments on sheep we selected animals with the wool coming well over the head, the instrument being applied to the head, over the ears. The wool did not seem to interfere in the least with the application of the current; this may be due to the longer spikes fitted to the instrument.

The first 20 or so sheep were given about 20 to 30 seconds application of current, and the carcasses and offal on subsequent examination were found to be extensively blood-splashed, patches about the size of a sixpenny piece being easily visible throughout the musculature, whilst the hearts were also very badly splashed. Clark and Tweed, in their report already mentioned, state that " It is obvious from these experiments that rise of blood pressure *per se* is not responsible for " blood splashing," for no case of splashing has been seen in animals stunned by the modified electric method . . . ." I assume they were referring to pigs and not to sheep. It is curious to note that splashing in pigs shot with a captive bolt pistol is quite common, whereas it is by no means common in sheep so shot. With the use of electricity the converse is the case, sheep being easily " splashed " whilst splashing is not seen in pigs.

As a result of our experience with the first 20 sheep, the application of current was reduced to a maximum of 10 seconds, when splashing

ceased altogether. Sheep apparently do not require more current than pigs, and from 5 to 10 seconds seems ample to render them unconscious. Only one application was given the sheep, as for pigs. Owing to the trembling of the muscles it was impossible to feel the pulse rate whilst the current was being applied, but immediately the electricity was switched off, and the animal was apparently unconscious, the heart beat registered 120 per minute. The corneal reflex was absent in most cases. The sheep were first laid on a "cradle" before applying the current and, as in pigs, the effect was instantaneous.

About 80 calves have also been successfully stunned by the same instrument, the current being applied at the cheek region whilst the animal remained standing, and also after first laying the calf on a " cradle " as for sheep (the latter method being better from the butcher's point of view). The effect was instantaneous in all cases; the hairy covering of the skin apparently did not interfere with the application of the current. Like sheep, calves only require from five to ten seconds application, otherwise one is liable to cause rupture of blood-vessels.

The Electrolethaler No. 2 is now in regular use here for the stunning of calves and sheep as well as pigs.

We have not yet tried electricity for the stunning of cattle. I understand the same instrument can be used, except for the tongs, instead of which a pair of insulated electrodes is attached to the open ends of an adjustable horseshoe shape support. These electrodes are sprung on to the head of the animal in the same way as the tongs are applied to the pig's head, but they remain in position, being retained by means of a spring, so that it is unnecessary to hold them by hand. The animal falls down immediately the current is switched on, but an average of 20 seconds or more is required to complete unconsciousness. It is possible for the animal to be bled while the current is still on. The stunning of cattle by electricity is regarded more in the nature of an experiment rather than as a practical proposition at present. The only demonstration of electrical stunning of cattle so far carried out in this country was held at Birmingham on December 4th, 1931, at the request of Mr. DeVine, the Chief Veterinary Officer, and to whom I am indebted for the following report:—

" In the case of beast No. 1, there was violent struggling and kicking, which was continued for two minutes. The animal was then bled. No. 2 animal went down much more quickly, and the butcher was able to carry out the sticking of the animal immediately. The struggling of this animal was not so violent as that of No. 1. With regard to the carcass and offal of No. 2 animal, this was well bled, but No. 1 was ' splashed.' "

Mr. DeVine does not consider that the use of the cattle-stunning instrument, in its present form, is a practical proposition, but the Electrolethaler has been installed and is in regular use for pigs at Birmingham. For sheep it is stated that the clamp has to be kept on for a considerable time owing to the wool being a good non-conductor. This is quite different from our experience here, and may be due to our special " spikes " before-mentioned.

RELIABILITY OF THE ELECTROLETHALER No. 2

This instrument is quite reliable provided it is used with reasonable care, and in accordance with the maker's instructions, but where the work is exceptionally heavy for one instrument it is apt to prove rather fragile. It is best to keep one spare instrument handy, as plugs and fittings are easily broken, whilst the aluminium material from which the tongs are made is rather brittle and easily broken, especially if the instrument is used on heavy animals like sows. The tongs become bent, and after being straightened out a few times they are liable to break. These accidents cause delay in slaughtering, but are soon mended where a staff of engineers is employed on the premises.

I would like to suggest to the makers of the Electrolethaler No. 2 that the tongs be of some stronger and more pliable material like steel, rather than aluminium, and that the metal spikes at the electrodes be made the same size on all standard instruments as they are on the instrument in use at Messrs. Marsh & Baxter's factory at Brierley Hill. This would enable the instrument to be used on sheep and calves as well as pigs.

Effect of the Electric Current on Consciousness

The difficulty of ascertaining when an animal is unconscious is accentuated when one realises that the " corneal reflex " is, after all, a reflex action, and does not necessarily indicate the presence or absence of consciousness. This absence of a reliable guide to consciouness is a handicap when one endeavours to determine whether the electric current renders the animal unconscious or whether it merely paralyses the pig for the time being. In calves, sheep and pigs, whilst directly under the influence of the electric current, the eyes are tightly closed. Immediately the current is switched off the eyes open, the corneal reflex being present in some cases and absent in others. In quite a large number of sheep examined, the reflex was absent. Anæsthetists have emphasised the unreliability of the corneal reflex as an indication of consciousness; thus we are forced to search elsewhere for some indication as to the effect

of the electric current upon the animal's brain.

The most positive way of ascertaining the effect of electricity on the brain is to submit a human being to an electric current and then obtain a record of its effect on such a subject. About 30 years ago, Professor Le Duc, Professor of Medicine at the University of Nantes, submitted himself to such an experiment. Le Duc was searching for an efficient electrical anæsthetic, one that would operate with less trouble than chloroform, ether, or other drugs, and without their unpleasant after-effects.

He used a direct current interrupted from 9,000 to 12,000 times per minute, the cycle of interruption being itself divided, and with a voltage varying from 12 to 220, the range from 110 to 220 volts being only applied where it was intended to kill the animal outright, whilst between 12 and 30 volts were used to induce sleep. Care was taken to see that there was no self-inductance in the circuit.

In his experiments on animals, Le Duc placed a cathode at the animal's head, and an anode at the other extremity; the current was applied and increased until general contractions occurred, and the animal fell on its side, the respirations ceasing. The current was then lessened until respiration commenced again, and at a certain degree of current a tranquil and regular sleep was obtained, the respirations and heart functioning normally, and with all other functions suppressed the animal, dog or rabbit, free from fetters, remained motionless in a profound sleep. Some animals were kept asleep for two hours and over without any ill-effects. The awakening was brusque; as soon as the current was interrupted the animal got up and frisked about joyously: the dog seemed to be gayer. If the current was applied slowly, there was a period of agitation as with chloroform, sleep took longer to obtain, and the operation seemed more painful.

It is necessary to note that with the Electrolethaler No. 2 the current is applied suddenly at from 40 to 70 volts, and not gradually as in Le Duc's experiments, with a low voltage at first, gradually increasing.

EFFECT ON THE HUMAN BEING

With the assistance of two colleagues, Le Duc submitted himself to the electric current. He afterwards stated that the only disagreeable sensation was that produced by the current on the skin of the forehead. His colleagues stopped the experiment as soon as Le Duc was unable to speak to them or answer their questions, thus they had not entirely extinguished consciousness, so he begged them to repeat the experiment! The second time the current was left on longer so that he could neither move nor speak, but he heard his colleagues' voices as from a distance, and he states that he felt sorry they did not continue the experiment a stage further! He compares his inability to move or speak with the ability to think, to a dream state or nightmare, where one is in the presence of danger and is neither able to move nor call for help. As soon as the current was switched off he recovered his faculties immediately, and was able to give an improvised speech with his usual ease.

It is to be regretted that Le Duc did not carry the experiment a stage further so as to produce full loss of consciousness, but the symptoms as far as they went are similar to those of chloroform anæsthesia: the state of helplessness, with voices trailing off in the distance, etc.

Le Duc's method aimed at the production of electrical anæsthesia over a prolonged period of time, and the electrodes were placed one at either extremity of the body, the current being gradually applied, whereas with the Muller-Weinberger method, the electrodes are both placed as near as possible to the brain, and the current is applied at one voltage only, and kept at that voltage until the animal is presumed to be unconscious. The aim of this latter method being to produce unconsciousness only for a sufficient period to enable the animal to be bled to death.

Early experiments carried out at the plant of Messrs. G. N. Hammond & Co., at Chicago, gave similar results to those described by Ducksbury and myself in 1929, but the American investigators found that by placing the electrodes one on either side of the head, the damage to the carcass could be avoided. Later they found that the best results were obtained by placing the tongs just behind the pig's ears. They also found that below 60 volts the instrument would not stun, whilst above 115 volts the shock is so severe as to cause serious injury. No marked difference could be distinguished in the effect of altering the interruptions from 4,000 to 12,000 per minute, but the best effects were believed to occur at between 3,000 and 10,000 interruptions per minute. The relation between the "on" and "off" periods in the interruptions was varied from 1/10 on and 9/10 off, to 7/10 on and 3/10 off, but no decided difference in effect was observed. It was found that the best results were obtained by application of the current to the hog for 4 seconds. Stunning was not effective below this, whilst no added effect was accomplished by prolonging the time, but great differences in the effect upon individual hogs were observed. (Similar differences have been noted here.)

The corneal reflex was employed by the American investigators in an endeavour to determine the absence of consciousness, but they are aware that this is by no means a reliable index, and they came to the conclusion that as

there was no suitable tool by which to gauge the effects of the current, they could only judge the results by a long series of tests and observations.

SOME OPINIONS ON THE PRODUCTION OF UNCONSCIOUSNESS BY ELECTRIC CURRENT

Various eminent American and other scientists were consulted, and on the invitation of Dr. Lipman, of Messrs. Swift & Co., Professor Boris N. Zawadsky, the Moscow Physiologist, was invited to witness the use of the electric stunning instrument in Chicago. Professor Zawadsky gave it as his opinion that the animals were insensible to pain immediately after they received the electricity, and that the method was most humane as it rendered the animals unconscious instantaneously. This emphatic opinion was based upon the animals' behaviour and appearance, the Professor stating that " although there is no test that can be applied quickly to prove definitely whether the animals are conscious or not, I think it reasonable and logical to assume that an electrical charge such as these animals are given, causing profound shock to the nervous system, must also abolish consciousness."

After this opinion, an eminent member of the staff of the Billings Memorial Hospital of the University of Chicago Clinics, with an international reputation for surgery of the brain and nervous system, and for original research in physiology, visited the works and witnessed the electrical method in use. He was of the opinion that the hogs were rendered unconscious, and compared the pigs to human beings in a typical epileptic seizure in which there are convulsions similar to the movements shown by the animals. In human beings consciousness never returns whilst the convulsions are present, so that when the convulsive movements can still be seen, consciousness can be assumed to be absent.

The next opinion given was that of a Professor at the North-Western University, a physiologist with an international reputation. He stated that the conditions observed might be indicative of lack of consciousness, or they might simply denote lack of muscular control with full possession of the sensations, as it was possible to paralyse the muscles and throw them out of control by the nerves without at the same time affecting the nerves which carry the sensations of pain. In consequence, the conditions observed might be merely a temporary paralysis with the animal retaining full sensibility to pain. The pig is unable to squeal owing to the throat muscles not responding, neither can it run or walk because the muscles are out of control, but it may be aware of all that is going on.

As a result of these conflicting views, the American Packers decided to submit the matter to a competent investigator, and to await his report on the subject.

Tests they carried out with the meat and cured products showed that these were no different from those from pigs killed without any preliminary stunning. Meat from electrically stunned pigs was cooked and tasted, being compared with that from ordinary "stuck" pigs, but no difference in flavour or texture could be detected. There were several instances in which samples from the electrocuted pigs were more tender, but this may have been due to the quality of the animal and not to the method of slaughter. Apparently no tests were made regarding the saving of extra blood.

Senor P. Marti, in the *Revista de Hygiena y Sanidad pecuarias,* quoted by the *Veterinary Journal*, Vol. 88, No. 2, after referring to the Muller method of electric slaughtering in use in Barcelona abattoir, states that it has given excellent results, the bleeding is perfect, and the meat has a nice appearance, whilst from a humanitarian point of view it seems that one could not wish for a more desirable method.

The Chief Veterinary Officer to the City of Birmingham, Major Brennan DeVine, who has had one of these electrical stunning instruments installed for use on pigs at the city abattoir, states that he considers the stunner to be an exceptionally good one in the case of pigs. It renders the animal unconscious immediately, and it remains unconscious whilst it is being stuck and bled, consequently there is no squealing or any noise from the slaughter hall. As this instrument renders the brain numb, he is forced to the conclusion that it is a humane instrument, and that the animal is unconscious to pain, and from the condition of the carcasses, as examined on *post-mortem*, there is no doubt that it does not interfere with the complete bleeding of the meat in any way.

One of these instruments has also been in use at Sheffield City abattoir, and Mr. Tweed, the Chief Veterinary Officer, together with Dr. Clark, Lecturer in Physiology at Sheffield University, whose report in the *Veterinary Record* has already been mentioned in referring to the production of loss of consciousness by electricity, state their opinion: " that consciousness is lost there is little doubt, for were it not so, the animal would make some attempt to regain its feet immediately the current is switched off, and would undoubtedly give vocal evidence of discomfort; moreover, during the hoisting process there is generally less movement than in shot animals and there is no indication of pain on sticking." Then after discussing possible causes of loss of consciousness these two authors go on to state that, " The possibility is left that unconsciousness may in some way be due to the production by electric stimulation of what, for want of a better name, may be called a

confusional state, but much more evidence is necessary before this suggestion can be definitely adopted."

It may be interesting to compare the stages of chloroform anæsthesia with those of electrical anæsthesia:—

CHLOROFORM ANÆSTHESIA	ELECTRICAL ANÆSTHESIA
First Stage	
Excitement, struggling, accelerated respirations, salivation, temporary suspension of breathing. Slowing of heart. Dilatation of pupils. Lateral movements of jaws.	Struggling ceases. Rigidity of forelimbs, contraction of hind legs. Muscular tremors. Eyes closed. (If current switched off, animal recovers immediately.) Slowing down of respirations.
Second Stage	
Marked excitement. Struggling. Irregular respirations and pulse accelerated. (If the drug be given concentrated the excitement stage if brief.)	Forelegs still rigid. Hind legs relaxed with kicking movements.
Third Stage	
Anæsthetic stage. Relaxation of muscles. Slowing of respirations. Pupils slightly contracted. Corneal reflex may or may not be present. Animal lies motionless and limp.	(When current is switched off.) General relaxation of muscles. Salivation. Acceleration of heart beat. Corneal reflex may or may not be present. Animal lies motionless and limp.

The similarity between the latter stages in both cases, as well as the observation of some thousands of animals being stunned by this electric instrument, leads one to the opinion that complete unconsciousness is produced. In Le Duc's experiments he found that by applying the current in gradually increasing doses a condition of excitement similar to that produced by chloroform in small doses was manifested, whereas by concentrating the current at the required voltage, as well as by concentrating the drug, the excitement stage is considerably lessened, and anæsthesia more rapidly produced. It is possible that whilst the first stage with the electric method, lasting for a few seconds only, may be a stage of paralysis, this soon passes off into a stage of general anæsthesia, so that when the animal is hoisted and bled, it is free of all feeling. If this is so then the claims of the makers of the Electrolethaler No. 2, that it is a "humane killer," are fully justified.

A committee of experts is now investigating this side of the matter, and their report will be awaited with interest.*

In conclusion, I would like to thank Major DeVine, of Birmingham, for permission to quote from his report on the instrument in use under his supervision, and also Mr. Osman Jones, B.Sc., for permission to utilise the report of Mr. R. W. Regensburger, of Messrs. Swift & Co., regarding the Le Duc and American investigations.

References:—

Ducksbury and Anthony. 1929. *Vet. Record,* Vol. ix, p. 433.

Edington and Elliott. 1931. *Ibid.,* Vol. xi, pp. 1303-4.

Clark and Tweed. 1932. *Ibid.,* Vol. xii, p. 177.

Marti, P. 1932. *Vet. Journal,* Vol. 88, No. 2, p. 76.

* We hope to publish this report in an early issue.—Ed., *V.R.*

THE FEEDING OF DAIRY COWS

The Ministry of Agriculture has issued a new Bulletin (No. 42) on "The Feeding of Dairy Cows." It is the work of Mr. James Mackintosh, of the National Institute for Research in Dairying at Reading, and contains the results of the most recent research upon this important subject. Clearly, it makes all the difference to the dairy farmer in the matter of money returns, especially in winter time, whether he feeds his cows on the most economical and productive ration or not. The cost of food is about 70 per cent. of the total costs of milk production in the winter and about 50 per cent. of them in the summer.

The Bulletin itself is divided into two main parts. The first deals with the composition of feeding stuffs, their digestibility, use for (*a*) maintenance and (*b*) production, and nutritive value; in addition to which there are laid down general feeding standards for (*a*) maintenance and (*b*) production for in-calf cows, and the minimum mineral and vitamin requirements are stated. Part I, in point of fact, summarises the most useful results that have accrued from the many investigations carried out both at home and abroad in recent years on the economic value of feeding stuffs.

Part II of the Bulletin deals with the selection of rations, and their quantities for different classes of dairy animals. It applies the newer knowledge to actual practice, having for its object the maximum production of milk at a minimum cost while, at the same time, maintaining the cows in good health.

Mr. J. F. Blackshaw, Dairy Commissioner of the Ministry, in a foreword to the Bulletin, points out that it is not possible to prescribe absolute standard sets of rations applicable to all the varying conditions that prevail in this country, so that farmers should make a careful study of the scientific principles outlined in Part I and use their discretion in making up rations on an efficient and economical basis. Mr. Blackshaw adds that under normal conditions a farmer should, however, be able to select a ration for immediate use by following the information given in Part II.

The Bulletin is to be obtained, price 9d. net, from H.M. Stationery Office, or through any bookseller.

Clinical and Case Reports

A FEW OBSERVATIONS ON THE RECENT INFLUENZA EPIDEMIC AMONG LONDON HORSES

H. C. P. KING, M.R.C.V.S., KENNINGTON CROSS, S.E.

Typical influenza broke out on November 19th, 1931, in a stud of 37 heavy draught horses, when three were noticed ill—one of which died the following day. November 22nd saw 14 more fresh cases in this stud and on December 5th, in spite of the rigid isolation and other precautions taken, there were only 13 horses that had not contracted the disease, and on that date they were given 30 c.c. P.D. & Co.'s anti-influenza serum, as also were seven of the worst cases that were already ill: of these seven, six showed a distinct improvement and fall of temperature within 36 hours and the seventh had a rise of temperature for 48 hours, which then subsided to normal.

Of the 13 working horses inoculated only one developed influenza—the others remaining at work. There were no ill-effects of the injection, either local or general, but on account of the rather large dose (30 c.c.) half was injected on each side of the neck.

The earlier cases were much more acute, with temperatures at about the 106° mark, and were of shorter duration than the later ones.

Abdominal pain was observed in several cases, necessitating the use of morphia; and in one case there was jaundice as a complication, the visible mucous membranes and the skin being yellow.

A notable feature of the epidemic was the suddenness of attack—extreme weakness with inco-ordination of the limbs, in addition to the usual pain and swellings of the legs. The pulse in many cases was irregularly intermittent.

A rather curious fact was that neither my partner nor myself had any cases occurring in undertakers' horses; is the explanation of this that one rarely sees these animals drinking at public water troughs, or was it just coincidence?

THE VALUE OF CALCIUM GLUCONATE IN MILK FEVER

WILLIAM HEPBURN, F.R.C.V.S., ABERDEEN

Recently I have had discussions, both verbal and written, with several members regarding the use of calcium gluconate (Sandoz) in milk fever cases, and I thought that a resumé of my experience might prove helpful to those members who have not yet employed the treatment in place of the old method of inflation of the udder.

It is now about two-and-a-half years since I adopted this system of treatment, and during this period I have treated, up to date, 335 cases of typical milk fever. The subjects belonged to all classes of dairy cows, with the exception of the Channel Islands breeds. Many of them were fresh arrivals from Ireland and the North of England.

The results of the treatment have been most satisfactory, being in fact practically 100 per cent. recovery, as out of the total, only one cow (a big, fleshy, old cow with retained placenta) did not regain her feet and was slaughtered.

I very seldom make a second visit to a typical milk fever case, and it is therefore somewhat difficult to obtain accurate information as to the time the cow rose after receiving the injection, but in the many cases I have been able to verify, I find the average time is 3½ hours.

In all new lines of treatment one naturally has to grope and find out the best method of its administration, in so far as it applies to oneself, and in this respect I have altered my technique considerably since I first tested the efficiency of the "Greig-Dryerre Treatment."

The general technique to be observed in the preparation and administration of "Sandoz" is, I consider, all important, if one is to obtain the best results, and avoid the sloughing sequelæ, which, so far as I can gather, constitute the bugbear in its adoption by many practitioners. These sequelæ I have now entirely eliminated.

In all, I have had seven instances of sloughing, one of which resulted from using an ampoule that had become "cloudy," and the remainder in cases in which the solution had not been freshly prepared, and thus some degree of precipitation had occurred; in these cases also it had been, on each occasion, injected cold. This latter condition I regard as the most important factor in the production of the slough, as during the cold season I find that the salt is very liable to precipitate even within 40 hours of its preparation, and it is this precipitate, no matter how slight it may be, that is the whole cause of the trouble.

The procedure I now adopt is as follows:—I put fully 2¼ ounces of the salt (Sandoz) into 48 ounces of water and boil for about 10 minutes, by which time the solution has evaporated to 42 ounces. This I double strain, either through the filter supplied by Sandoz, or through a double fold of fine muslin, into two bottles. While the solution is in preparation I fill the bottles with warm water, to which have been added a few drops of formaldehyde, to ensure their sterilisation.

For the administration I use a Janet syringe of 200 c.c. capacity, with a fairly large needle

—1 mm.—to which is attached a piece of rubber tubing 3-10 in. long to allow a little flexibility between the syringe and needle. An enamelled graduated measure is used as a container. The syringe, needle and measure before use are sterilised in warm lysol solution. The skin at the site of the injections is also sterilised. Half of the solution is injected at one point on each side—about the upper posterior third of the neck—and massaged towards the head. The actual time required to inject the quantity into each side need not exceed a couple of minutes. I find the solution flows more readily out of the syringe if the needle be inserted into the deeper subcutaneous fascia; thus no swelling is caused at the time of administration or afterwards, and very little massage is then required.

On two occasions only have I administered calcium gluconate intravenously, but with no better results than by the subcutaneous route; my principal reason for adopting the intravenous route was, however, to perplex a rather inquisitive onlooker who was a "handy" man to all his neighbours with the inflation pump.

To summarise the chief points:—

(1) Use 2 to 2¼ ounces of calcium Sandoz.
(2) Boil 10 minutes at least in 48 ounces of water, and double strain.
(3) Always administer hot, even very hot.

I strongly recommend the solution being administered hot, never less than 115° F., and I have, on many occasions, given it at a much higher temperature. The observance of this point ensures perfect solution, and judging from the results I have had, I think it accelerates absorption, and even at the very highest temperature at which I have used it, the injection did not produce the slightest discomfort or other untoward effect on the patient.

To complete one's outfit it might prove an advantage to procure two thermos flasks in which the solution can be conveniently carried.

Since the beginning of 1931, when I commenced using the quantity of the salt and the method of injection as described, I have not had one single case of sloughing or abscess formation.

I find from my notes that during the above-stated period only three cases required more than one visit. Two developed a second attack within 48 hours, and a third, which was attended by my assistant, had a relapse for the third time, and received the injection on each occasion. No trouble was experienced afterwards; the cow milked well and is again in calf.

In contradistinction to this case I might here cite one which had been inflated three times by the cattleman, and had not only failed to regain her feet, but had experienced a relapse as severe in degree as that of the initial attack. Professional aid was then requested; the case received a full dose of calcium Sandoz, administered very hot, and was up and well within three hours.

I might mention here that I always leave a saline drench to be given in treacle as soon as the cow can swallow comfortably, and further treatment is seldom, if ever, called for.

One other matter that has rather impressed me is that of retained placenta in milk fever cases. So far as I have been able to observe, the injection seems to have had a beneficial effect in hastening the dislodgment of the placenta, and certainly in those cases in which manual assistance has to be resorted to, I find that the placenta has been removed with greater facility than is experienced in other cases in which the placenta has been retained.

My extended experience of the use of the calcium method of treatment confirms my formerly expressed belief that it is much to be preferred to the old inflation system:—

(*a*) It does not possess the disadvantage of direct interference with the function of the mammary gland. It is a well recognised fact that after mammary inflation the cow does not return to her full secretion of milk for at least seven to ten days, and if inflated more than once she never milks so freely as formerly. Also there is no risk of mastitis supervening, such as can be attributed to the practice of mammary inflation.

(*b*) It is a rational treatment, and because of the various technicalities that have to be observed in its use, it is not likely to be employed personally by the cow-owner or the ordinary cattle attendant, as has been the case hitherto with the air pump.

Many of my clients who formerly treated all their own milk fever cases now call in professional assistance, and in every case request that the calcium treatment be applied; which circumstance, in itself, justifies, I think, its extended use by the profession.

MILK IN SCHOOLS

In co-operation with the Education Committee, arrangements have been made by the Devon Agricultural Committee for supplying milk of Grade A standard to pupils attending elementary schools in the county. Each child is supplied with one-third of a pint of milk in a specially sealed bottle, for which one penny is paid. The number of school days in a year varies from 210 to 220; taking the average as 216 days, it is found that each child will receive 9 gallons of milk in a school year at a cost of 18s. Up to the middle of November 3,783 children were taking milk, and it will require 34,047 gallons at a cost of £3,404, to supply them for a school year. The scheme, it is reported, is steadily growing and is self-supporting, the parents paying the penny per child per day. The Committee expressed satisfaction at the success of the scheme from two points of view—the health of the children and assistance to the dairying industry in the county.

Abstracts

[Anti-tuberculous Sensitiveness in Calves Vaccinated with B C G. Paltrinieri, S. *Bolletino della Sezione Italiana, Societa Internationale di Microbiologia.* (1931.) Vol. III, Fasc. V. 167.]

The author has carried out research on the specific humoral antibodies which appeared in the blood serum of calves vaccinated subcutaneously, when 10 to 15 days old, with B C G. In the fixation of complement tests which he made, he used Besredka's egg antigen. The calves were tested prior to vaccination by the intradermal tuberculin test or by the fixation of complement test; both healthy calves and tuberculous calves were always tested as controls at the same time. He describes a method of giving a unit value to his results. He found that:—

(1) The fixation of complement test was always positive in calves vaccinated with B C G.

(2) Antibodies were detectable eight to ten days after injection of the first vaccine. They were small in amount and tended to diminish and disappear in the fourth, fifth and sixth month after vaccination.

(3) There was an increase in the amount of antibody after the second vaccine (inoculated six months after the first vaccine) and although it later diminished in quantity, it never quite disappeared.

(4) After the third injection (12 months after the second), there was a remarkable increase in antibody content, but not as much as was found in tuberculous calves.

(5) There appeared to be a correlation between the intensity of the local reaction and the antibody content. Thus:—

(*a*) In calves which show a stronger local reaction, with nodules as large as hen eggs, there was a greater amount of antibody;

(*b*) The longer the persistence of the local reaction the longer was the duration of antibodies in the serum.

C. McG.

* * * * *

[A Contribution to the Diagnosis of Tuberculosis in the Horse. Hofferber. *Tierärztl. Rdsch.* xxxvii, 831-832.]

The author describes a case of tuberculosis in an 11-year-old gelding. The diagnosis was confirmed by the examination of blood (blood-picture, the rate of sedimentation, differential count), by radiological examination, and by the cutaneous tuberculin test.

H. F.

* * * * *

[Thallium Poisoning in Domestic Animals. Farber. *Tierärztl. Rdsch.* xxxvii, 750.]

Thallium compounds, as far as the author is aware, are not used for therapeutic purposes. Thallium sulphate (Tl_2SO_4) in the form of paste or grains of wheat filled with the drug, is used as rat and mice poison. The author places on record cases of thallium poisoning (*a*) in a nine-months-old bullock, which died on the third day after onset of symptoms, and in the rumen of which fine poisoned grains were found; (*b*) in a mule which ate in a clover field a piece of bread filled with poisonous paste and became ill, but recovered on the sixth day. In both instances symptoms consisted of loss of appetite, diarrhœa, stiffness of gait, lachrymation, laboured breathing, arched back, etc.

H. F.

* * * * *

[Important Types of Poisoning amongst the Domestic Animals. Svensson, S. (1931). (Trans-title.) *Skan. Vet.-tidskr.* 9. 292-307. 1 table. 11 references.]

The author discusses poisoning by the following substances: fluorides, phosphorus, arsenic, barium, lead, mercury, zinc, saltpetre, corrosive acids, corrosive alkalies and strychnine. In each instance the organs are enumerated in which the respective poisons are most likely to be detected. A summary of 117 cases of poisoning detected by chemical examination is appended. From this it is seen that lead is responsible for the greatest number of fatalities in cattle, whilst strychnine and phosphorus are the commonest poisons in the dog and poultry respectively. The acute type of lead poisoning in cattle is recognised and its symptomatology discussed.

G. B. B.

* * * * *

[Milk Fever in Cows during the Eighth Month of Gestation. Stuhlenmiller. *Tierärztl. Rdsch.* xxxvii, 757-758.]

This is a record of two cases in a five-years-and in a 15-years-old cow respectively, both in the eighth month of gestation, which showed typical symptoms of milk fever. Air insufflation brought about a complete recovery in one case, whereas in another case the paralytic symptoms were so advanced that treatment was of no avail.

H. F.

N.V.M.A. Divisional Report

SCOTTISH METROPOLITAN DIVISION*

ANNUAL MEETING AT EDINBURGH

Double Intradermal Tuberculin Test Demonstration and Discussion

The Annual Meeting of the Scottish Metropolitan Division, N.V.M.A., was held at the Royal (Dick) Veterinary College on February 10th, 1932.

During the course of the meeting the following members and visitors signed the attendance book:—Major R. G. Anderson, Messrs. Esmond Brown, James F. Baillie, Professor G. F. Boddie, Messrs. D. Cameron, C. B. Davidson, E. G. Duncan, H. F. Downie, A. Gofton, Professor J. Russell Greig, Major J. Judge, Messrs. J. Ker, A. M. Larnach, Professor R. G. Linton, Major J. G. MacGregor, Messrs. J. MacFarlane, A. L. Robertson, R. H. Robertson, W. G. Robertson, Major J. Robertson, Messrs. W. Scott, J. S. A. Spreull, A. Sillars, Major A. Spreull, Messrs. W. Watt, J. P. Walker, P. Wilson, H. M. Wilson, J. E. Wilson, T. P. Young, together with Major W. M. Mitchell (President) and J. N. Ritchie (Hon. Secretary).

There were present as visitors:—Miss M. H. Christison, Mr. D. S. Barbour, Dr. E. P. Calder, Messrs. L. Dougal, J. S. Holgate, T. M. Mitchell, James McDougall, E. Mackay, W. J. B. Robson, A. E. Stevenson, Dr. J. C. Simpson, Dr. Chalmers Watson and several students.

Apologies for absence were received from Dr. O. Charnock Bradley, Messrs. F. A. Gordon, T. M. Inglis, W. C. Miller and W. Nairn.

At 11.30 a.m. Mr. R. E. Glover, of Cambridge, was introduced by the President and gave a demonstration of the double intradermal tuberculin test, using for this purpose eight animals which had been tested previously (this was the 72nd hour after the first injection). Mr. Glover gave a clear and concise description of the test. He first asked the members to examine a non-reactor and then demonstrated on a cow which had given a reaction which did not show a large swelling, but which showed definite œdema, especially immediately below the site of inoculation. The members then examined the animals and saw four which gave positive reactions and four which failed to react. Broth controls had also been used in three of the animals—one reactor and two which failed to react.

The meeting adjourned for lunch at 12.30.

At 2.15 Professor Mitchell (the President) occupied the chair at the reconstituted meeting.

The minutes of the previous meeting, which had received publication in the *Veterinary Record*, were signed as correct.

Nomination of New Members.—Dr. Greig nominated Mr. W. H. W. Baird, Dalkeith, and Mr. W. D. Macrae, Assistant Veterinary Inspector, Midlothian, as members of the Division, and these nominations were seconded by Professor Linton.

Correspondence.—A letter was read from the Secretary of the Royal Sanitary Institute asking that a delegate be sent to the Institute Congress at Brighton from July 9th-16th, 1932. The President intimated that the Council had recommended that Professor Linton be asked to attend as the delegate from the Division and failing him the President's nominee. Professor Boddie moved accordingly and Major Spreull seconded. This was carried unanimously.

Victoria Veterinary Benevolent Fund.—The President referred to the subscription to the Fund in the past and said that the Council recommended that the usual subscription of £4 4s. be sent. Mr. Gofton, in moving that the sum of £4 4s. be subscribed, expressed the hope that this would stimulate individual members to support the Fund. Major MacGregor seconded. It was also agreed that the sum of £1 1s. be sent to the Ladies' Guild which is being formed and for which Mrs. MacGregor, Stirling, is acting as representative in Scotland. Both propositions were put to the meeting and carried unanimously.

Golf Competition.—The President drew attention to the notice which had appeared in the *Veterinary Record* of February 6th, 1932, in this connection and hoped that members would send their names to the Secretary so that a draw for the preliminary match play might be made.

Treasurer's Report.—The Hon. Treasurer read his report, which was adopted on the motion of Major MacGregor, seconded by Mr. Gofton.

Next Meeting.—It had been suggested by the Council that the June meeting be held at the Moredun Institute. Dr. Greig promised to give the matter favourable consideration, but explained that June is not a suitable month for a meeting at Moredun, from his point of view. The President expressed a hope that Dr. Greig would see his way to have the meeting at Moredun as suggested.

Tuberculin Testing: Address by Mr. Glover

The President then called on Mr. Glover to address the meeting.

Mr. Glover said he greatly appreciated the honour of being asked to address the Society. He had had the opportunity of speaking before several Divisions on the subject of tuberculin tests, but this was the first occasion in Scotland. Mr. Glover then made a few remarks on the intradermal method, with particular reference to irregularities in making the inoculations and to incorrect interpretations of the reactions. He explained the technique which he favoured and stressed the importance of using a needle of adequate length in order to ensure that the tuberculin reached the deeper layers of the skin. He also pointed out the necessity for the second injection since a fair proportion of tuberculous

*Received for publication March 14th.

animals failed to respond to the sensitising dose, but reacted to the diagnostic inoculation. In interpreting the test, he did not place much reliance on measurements alone (which were chiefly useful for recording purposes) but particular attention should be paid to the character of the swelling and especially to slight diffuseness. Heat and pain were subsidiary characteristics and were often absent or difficult to detect.

After a brief reference to other methods of testing, Mr. Glover referred to the remarks made by Mr. Gofton in his presidential address to the veterinary section of the Royal Sanitary Institute at Glasgow concerning the maintenance of tubercle-free herds. In this address Mr. Gofton emphasised the dangers which might arise through the recruitment of these herds from doubtful or infected sources, and considered it should be made a condition of the licence that a herd producing certified or Grade A (T.T.) milk should be self-contained or augmented only from clean self-contained herds.

Mr. Glover was in absolute agreement with this point of view, which he considered was of the highest importance. He expressed the opinion that in attempting to build up and maintain a tubercle-free herd it was advisable to apply the test at three-monthly intervals until the herd was entirely free from infection: tests at six-monthly periods were not entirely satisfactory so long as reacting animals were being detected.

In conclusion, he wished to express his deep sense of gratitude to Mr. Ritchie, who had so kindly procured the animals for the demonstration and had also undertaken the inoculations; and also to Professor. Mitchell for making the excellent arrangements for viewing the animals.

DISCUSSION: MR. GOFTON'S EXPERIENCES

Mr. Gofton expressed his appreciation of Mr. Glover's address and of the very complete arrangements which had been made by Mr. Ritchie for the demonstration.

He had always felt it was a matter for regret that official recognition of the subcutaneous test had been withdrawn by the Departments of Health in England and in Scotland. The subcutaneous test had a wealth of experience accumulated behind it, whereas the double intradermal test, at the time of its official adoption, was, relatively speaking, a new test, in the application of which comparatively few had had experience. He had never found any ground for complaint against the subcutaneous test, provided it was employed under properly controlled conditions and the results were intelligently interpreted. On the other hand, he had experienced quite a crop of difficulties with the double intradermal test, which had left him wondering. Pain was a relative factor and in the interpretation of the test in some animals manifestations of pain had to be almost entirely ignored owing to the temperament of the animals. Some animals when approached with the syringe, if they had had previous experience of the test, were at once disturbed and some regularly gave a roar immediately the needle was inserted into the skin. Other animals appeared to be quite indifferent to the needle and to the handling of any swelling which followed the injection of tuberculin. The cow, "Margaret," No. 89 (referred to in the tables), was an animal in which no account could be taken of pain. Whenever the skin of her neck was handled, whether she was under test or not, she cringed away from the touch, held her head to one side, and gave manifestations indicative of pain.

He would quote his experience in two herds which were chosen because of his intimate association with them since their foundation and because he had had exceptional opportunities of watching *post-mortem* examinations of reactors. No. 1 herd was self-contained and comprised about forty cows with twenty-five to thirty head of young stock. After the herd was established, the subcutaneous test revealed an occasional reactor during the first few years. In every case but one, *post-mortem* examination revealed a definite tuberculous lesion in explanation of the reaction. The single exception was a home-reared animal which gave a very doubtful reaction but which was turned out and slaughtered by the owner rather than run any risk by her retention. When the change over to the double intradermal test was made in 1929, in accordance with the official decision of the Department of Health, the results given by the subcutaneous test were confirmed by the double intradermal test. In only one case had there been a suggestion of a reaction in a young six-months-old heifer at first test. This animal was unfortunately disposed of and was not submitted to *post-mortem* examination. In all other cases the double intradermal injection had produced only clearly defined circumscribed swellings without pain or œdema, which gave no suggestion of a reaction.

Experience in the second herd was in rather striking contrast. The herd in question was founded in 1927. Great care was taken in the purchase of the foundation stock, all of which were bought subject to a check test after delivery. One heifer gave rather an interesting result to this check test. She arrived with a clean record to the subcutaneous test. To the double intradermal test on arrival she gave a definite reaction. Under arrangement with the vendor she was retained in isolation for three months, at the end of which time she received a double dose of tuberculin subcutaneously and gave no reaction whatever, but she again reacted to a double intradermal injection. Unfortunately, an opportunity to make a *post-mortem* examination did not arise.

During the period 1927 to 1929 the subcutaneous test was used in this herd. Apart from a few reactors in newly-purchased animals, which were never admitted to the herd, the subcutaneous test revealed only one doubtful

reactor. The animal was slaughtered and gave a negative *post-mortem* examination. With the change over to the double intradermal in 1929 there followed a number of reactors. The records of the tests of these animals are shown in the following tables:—

No. 79: "Snowflake"

April, 1929. *Subcutaneous Test.* *Ophthalmic Test.*

Injection	9th	12th	15th	18th hour.	
101·2	101·4	101·2	101·2	100·8	Negative.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.	
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).		
		*Oedema	†Pain.		*Oedema	†Pain.			
Nov. 3	6	0	0	7	x	x	15	Doubtful	
„ 29	7	x	x	15	xx	xx	20	Fail	Retest
	Broth								
	No reaction								

Post-Mortem Examination—Negative.

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No. 74: "Sarah"

April, 1929. *Subcutaneous Test.* *Ophthalmic Test.*

Injection	9th	12th	15th	18th hour.	
101·4	100	101·4	101·6	101·8	Negative.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
Nov. 1930	6	0	0	7	0	0	12	Pass
April	6	x	x	9	xxx	xxx	18	Fail

Post-Mortem Examination—Negative.

Biological Test—Guinea-pig killed after 62 days—Negative.

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No. 73: "Sylvia"

April, 1929. *Subcutaneous Test.* *Ophthalmic Test.*

Injection	9th	12th	15th	18th hour.	
102	101	100·8	101	101·8	Negative.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
Nov. 1930	6	0	0	6	0	0	6	Pass
April	5	0	0	6	0	0	7	Pass
Oct.	5	x	x	14	xxx	xxx	30	Fail

Post-Mortem Examination—Negative.

Biological Test—Two guinea-pigs died of intercurrent disease 29 and 34 days after inoculation. One rabbit killed after three months; no tuberculosis. Two fowls killed after three months; no tuberculosis.

No tuberculosis,

No. 30: "Wendy" (Heifer). (Home bred.)

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
1930								
Dec.	7	0	0	8	0	0	9	Pass
1931								
May	6	0	0	8	0	0	9	Pass
Oct.	8	x	x	16	xx	xx	16	Fail

Post-Mortem Examination—Negative.

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No. 89: "Margaret." (Bought December, 1929.)

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
1930								
April	6	0	0	7	0	0	8	Pass
Oct.	9	x	xx	16	xx	xx	18	Fail
	Broth 6	0	xx	7	0	xx	8	
Nov.	Re-test ?		? ?					Doubtful
1931								
May	8	0	x	8	0	x	9	Pass
Oct.	8	0	x	8	0	x	9	Pass

With regard to the cow "Sarah," No. 74, the material used for the biological test was a part of the bronchial lymphatic glands. In the case of the cow "Sylvia" the inoculum was made from post pharyngeal, bronchial, mediastinal, hepatic and mesenteric glands. The glands, before incision, were removed to the laboratory in order to eliminate the risk of possible accidental tuberculous infection in the slaughterhouse.

On the same day as cow No. 74 was slaughtered, Mr. Ritchie, quite independently, sent into the abattoir two cows from a certified herd, which had given reactions to the double intradermal test. It was rather striking that in not one of the three reacting animals slaughtered on the same day was it possible to demonstrate a single macroscopic lesion of tuberculosis, notwithstanding a most careful search.

The cow "Margaret" was the animal to which he had already referred, in which apparent manifestations of pain must be ignored. "Sylvia" and "Margaret" gave positive reactions on the same day. After the negative *post-mortem* of "Sylvia," it was decided to hold "Margaret" in isolation for a re-test. Unfortunately, the number of the cow was not placed against the record of the second test and the result was therefore not shown on the table. It was, however, clearly within his recollection that the re-test left him still in some doubt as to whether the animal should be classified as a reactor or not. The two subsequent tests in 1931 were quite clear.

Summarising the results in this herd over the period of four years, in the first two years the subcutaneous test gave one doubtful reactor with a negative *post-mortem*. Over the next two years the double intradermal test gave five positive reactions with four negative *post-mortems* and one cow which gave no reaction at two subsequent tests six and twelve months later.

These results had left him speculating. He wished to make it quite clear that the observations were not made with the object of proving the value of any particular test or finding evidence in condemnation of it. His sole object was to ascertain whether infection existed in the herd and if so, to take the steps necessary to eliminate it. He had failed to find any trace of infection not only in the animals which were slaughtered following the test, but in all other animals belonging to the herd which he had had the opportunity of subjecting to *post-mortem* examination.

In official work it was the function of the official to protect the interests of the consumer of milk: at the same time he must have regard for the legitimate rights of the owners of dairy stocks. It must not be assumed that what he had said was meant to be a condemnation of the double intradermal test. He would admit quite frankly that the double intradermal was a valuable and very useful test but, in his hands, it had not revealed anything which the subcutaneous test had failed to reveal. It had, however, given him some very contradictory results which caused serious thought.

Mr. J. N. Ritchie thanked Mr. Glover for his most interesting address. He gave the particulars of tests of the two cows, which had reacted and showed no tuberculous lesion on *post-mortem*, to which Mr. Gofton had referred. He also gave particulars of two other cows which had given similar unhappy results. A fifth cow (No. 2 of the demonstration animals) also gave rather conflicting results to the double intradermal and subcutaneous tests. This cow had been tested again at that meeting and had reacted to the double intradermal test.

"Black"

November, 1929. *Subcutaneous Test.*

Injection	9th	12th	15th	18th hour.
101·4	101·2	101·4	101	101·2

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
1930 April	5	xx	x	14	xx	x	22	Reactor

Post-Mortem—Negative.

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"Lizzie"

Subcutaneous Test.

	Injection	9th	12th	15th	18th hour.	
May, 1929.	101·6	101	101·8	101	101·6	Pass.
November, 1929.	101·4	101·2	101·4	102	100·6	Pass.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
1930 April	6	0	0	9	xx	x	17	Reactor

Post-Mortem—Negative.

The Minister of Health has caused draft regulations to be prepared to amend the Public Health (Imported Food) Regulations, 1925, as from January 1st, 1933.

The Regulations of 1925 require *inter alia* that when edible parts of the carcass of a pig (including edible offal) are imported they must be accompanied by an Official Certificate of the country of origin which is for the time being recognised by the Minister. The object of the proposed amendment is to extend this requirement to the meat of other animals used for the food of man.

Captain Guy Dolman, of the Natural History Museum, South Kensington, has made a plea for accuracy in natural history films. He points out that many jungle films are utterly misleading as to the geographical distribution of the animals portrayed, and the "natural surroundings" are often based on vegetation coming from localities situated many thousands of miles from where the animals really live. He is particularly anxious for accuracy in jungle films, because their educational value is very high, and they are a type of educational film in which children show a real interest.

"Flo. II"

Subcutaneous Test.

May, 1929.	Injection 101	9th 100·6	12th 101	15th 102·2	18th hour. 101·4	Pass.
November, 1929.	101·6	100·6	101	101·2	101·4	Pass.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema	†Pain.		
1930 April	5	0	0	12	x	xx	13	Doubtful
Retest	5	0	x	9	x	xx	12	Reactor
	Broth 5	0	x	6	0	x	9	

Post-Mortem—Negative.

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"Connie"

Subcutaneous Test.

May, 1929.	Injection 101·4	9th 101·4	12th 100·8	15th 101	18th hour. 101	Pass.
November, 1929.	101·8	101·8	101·4	101·4	100·8	Pass.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
1930 April	5	0	0	9	x	x	13	Doubtful
Retest	5	0	0	8	x	0	12	Pass.
	Broth 5	0	0	8	x	0	12	
Nov.	5	x	0	10	xx	x	x	Doubtful
Retest	5	x	0	7	x	xx	13	Reactor
	Broth 5	0	0	6	0	0	8	

Post-Mortem—Negative.

BRITISH SHEEPDOGS FOR AMERICA

An American observer who was much impressed with what he saw at the sheepdog trials held in Hyde Park, London, last year, has arranged that some of the leading competitors shall give demonstrations in the United States and Canada during the autumn. The selected representatives—Mr. A. Millar (Scotland), Mr. J. B. Bagshaw (England), and Mr. L. J. Humphreys (Wales)—will take with them the dogs they used in Hyde Park, except Mr. Millar's dog, Ben, which secured the Hyde Park championship, and was recently exported to Australia. Mr. Reid, Secretary of the International Trials, has been invited to take part in the tour and superintend the demonstrations.—*Farmer and Stock-breeder.*

That the common cold might be one of the penalties paid for civilisation and might be a device of nature to vaccinate us against more serious evils was a view expressed by Sir St. Clair Thomson, M.D., F.R.C.P., F.R.C.S., at a recent meeting of the Section of Laryngology of the Royal Society of Medicine. He referred to the witty saying that a common cold lasted a fortnight, but if treated it only lasted 14 days.

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That all meat should be inspected by qualified officials at time of slaughter was emphasised at the hearing of a recent case in London, when a Somerset sender to Smithfield Market was fined £20 and £10 2s. 6d. costs for depositing mutton for sale which was found to be diseased and unfit for human food.

"Speculation"

No. 2 of the animals tested at the meeting. Results of her test and *post-mortem* at the meeting are given later.

Double Intradermal Test.

	Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.
		Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).	
		*Oedema.	†Pain.		*Oedema.	†Pain.		
1931								
April	5	0	0	7	0	0	10	Pass.
Nov.	5	xx	0	14	xx	x	24	Reactor
14/11/31	Injection	6th	8th	10th	12th	14th	16th	18th Hr.
	101·2	102	102	101·8	101·2	101·2	101·4	101 Pass
	4	0	0	8	0	0	11	Pass.
Nov. {	Broth							
	5	0	0	8	0	0	8	
17/1/32	Injection	5th	9th	12th	15th	18th		21st Hr.
	101·6	102	102	101·2	102·4	102·6		102·4 Pass
	5	x	x	10	xx	x	14	Reactor
20/1/32 {	Broth							
	5	0	0	8	0	0	9	
	This cow is No.	2 among	those	tested at the meeting				

Mr. T. M. Mitchell remarked that Mr. Glover had mentioned the site of injection as the skin of the neck and had also mentioned the subcaudal fold, but did not favour this site. Many cows came into his district which had been tested by injection in the skin over the region of the scapula: was there any preference, or was the skin equally sensitive in various positions?

Major J. G. MacGregor said he had always had good results in using the subcutaneous test. When the double intradermal test was introduced the large number of reactors tended to make them hail the new test as a heaven-sent gift, but he must confess that the longer he used the test the more befogged he became. Lately he had an experience which made him rely rather more on the evidence of pain than he had previously done, but that day other speakers had mentioned their difficulty in assessing pain, and he became more befogged. He had used the broth control on some doubtful reactors and most of them had passed at this test without any doubt. If an option was given which test, the subcutaneous or the double intradermal, was to be used he would prefer the subcutaneous. He thanked Mr. Glover and hoped that his demonstration and address would be productive of much good to the Division.

Mr. Esmond Brown expressed his interest in the proceedings and in the different opinions put forward. About ten years ago he did a long series of tests in the subcaudal fold. He had not the opportunity of making *post-mortem* examinations but usually the subcutaneous test and the ophthalmic was also used, so that a fairly reliable opinion could be given. He agreed with Mr. Glover that there might be difficulty in injecting the tuberculin into the skin in this site. Very often the first thing noticed with this test was a puffy swelling, about the size of a cherry and upwards, at the 12th hour, which disappeared. The specific reaction was looked for at the 48th hour and increased at the 72nd and beyond. He thought it might be important to know in the double intradermal test if the swelling was increased or diminishing at the time of the observation: and for this reason probably too few observations were made. From his experience with the subcaudal fold method he wondered if it was really necessary to make a second injection in the intradermal test.

Dr. Calder, Stagehall, was called on by the President. He thanked the Division for inviting him to the meeting and expressed great interest in the proceedings. From an experience of over ten years in a "Certified" herd he believed that the subcutaneous test was very reliable if it was properly interpreted.

Dr. Chambers Watson was next called upon to speak. He said how much he had enjoyed the meeting, particularly the earlier part, which he looked on as a very instructive piece of clinical research. He had gathered certain impressions through association with a tubercle-free herd and so far they were in favour of the older method. He thought that there must always be difficulty in saying whether or not œdema was present, for this depended so much on the texture of the skin, which certainly varied. Mr. Glover had asked the meeting to make a clean cut division between reaction and non-reaction and not to admit of doubtful cases, but he felt that they must admit doubt. He had one heifer which gave a doubtful reaction and was removed from the herd and no lesion of tuberculosis was found. He thanked Mr. Glover and the Division for its invitation to so interesting a meeting.

At this point the meeting adjourned to Gorgie Abattoir to see the *post-mortem* examinations on the animals tested.

DOUBLE INTRADERMAL TEST. FEBRUARY 10th, 1932

Preinjection measurement of skin fold (millimetres).	Observations at 48th hour.			Observations at 72nd hour.			Result.	Post-mortem.
	Description of swelling.		Measurement of skin fold (millimetres).	Description of swelling.		Measurement of skin fold (millimetres).		
	*Oedema.	†Pain.		*Oedema.	†Pain.			
No. 1 3	0	0	4	0	0	6	Pass	No tuberculosis
No. 2 5	0	0	7	x	x	13	Reject	No tuberculosis
No. 3 5	x	x	10	xx	xx	16	Reject	Tuberculosis lesion in left post-pharyngeal gland, mesenteric glands, hepatic gland, lungs substance, bronchial and mediastinal glands.
No. 4 Tuberculin 4 Broth 5	xx x	xx x	22 9	xxx x	xx x	40 10	Reject	Tuberculosis lesions in lungs substance, bronchial and mediastinal glands, liver substance, hepatic gland, kidney substance, udder substance, costal pleura (R. & L), peritoneum (R. & L). All body glands examined were tuberculous.
No. 5 4	0	0	5	0	0	5	Pass	*Very small lesion in one bronchial gland.
No. 6 5	x	x	9	x	x	13	Reject	Tuberculosis lesions in lungs substance; bronchial and mediastinal glands.
No. 7 Tuberculin 6 Broth 6	0 x	0 x	8 10	0 0	0 0	10 12	Pass	No tuberculosis
No. 8 Tuberculin 7 Broth 6	0 0	0 0	9 8	0 0	0 0	13 10	Pass	No tuberculosis

*Lesion had appearance of a small tuberculous focus, but on account of its doubtful character it has been submitted to a biological test.

The discussion was resumed in the Business Room of the Corn Exchange, Gorgie.

Professor Geo. F. Boddie expressed interest in Mr. Glover's remarks on the dental syringe: he had always used this with good results—there was no need to use a very short needle with a dental syringe. He thought it was useful to see reactors and doubtful cases after the 72nd hour, for while reactors would probably continue to increase in size the doubtful swelling which was really negative would diminish. In the case of aged bulls he found particular difficulty and in his opinion the test was practically useless for these animals. Mr. Glover had said the subcutaneous test failed in the graded herd because it was done at frequent intervals. Professor Boddie was not sure the same thing did not apply with the double intradermal test; at all events, one usually found the best reactions in animals which had never been tested before. A test which could be applied every three months was certainly an advantage from the economic standpoint as well as from the other.

Major R. G. Anderson stated that the meeting had not helped him much in clearing up doubt as to what was a reactor and what was not. The fact that *post-mortem* examination had not borne out some of the results of the test seemed to suggest that the test left much to be desired. He would favour optional testing—that the veterinary surgeon be allowed to use the test which was best in his opinion.

THE REPLY

Mr. Glover, in his reply, said that he had much enjoyed the meeting and the discussion which the demonstration had evoked. In the first place, he wished to refer to the *post-mortem* examinations of the tested animals. It would be noted that in six instances, the interpretations were confirmed by the *post-mortem* findings. On the other hand, cow No. 2, which was rejected, showed no macroscopic lesions: doubtless there were minute lesions which could be detected by guinea-pig tests. Cow No. 5 was negative to the test and showed a suspicious lesion which was being subjected to further test.

Mr. Glover then proceeded to say that he had been most interested in the figures which had been presented by Mr. Gofton and Mr. Ritchie. Mr. Gofton had had a wide experience of tuberculin tests and his observations were of the greatest value. At first sight it would appear that he had brought forward definite evidence that the intradermal test was inaccurate. As an example of the difficulty of detecting tubercle bacilli in some of these cases, he (Mr. Glover) would like to cite an interesting case which he had recently encountered. The animal in question presented a slightly diffuse swelling which was classified as a reaction. On *post-mortem* examination no macroscopic lesions were found and smears and sections from various organs and glands were negative. Selected lymphatic glands were emulsified, after suitable treatment to avoid extraneous contamination, and were inoculated into four guinea-pigs. When killed two months later, two guinea-pigs were entirely negative and two were positive. It was conceivable that even a biological test might occasionally fail to reveal a minute tuberculous lesion.

He was asked whether the skin was equally sensitive in various positions. As far as their evidence went, all parts of the body were equally sensitive. The skin of the neck was chosen as a convenient site, but there was no objection to using the region of the scapula.

He agreed that the appearance of a non-specific swelling shortly after the first injection was not uncommon. It was sometimes caused, he thought, by the puncture of a small vessel and usually disappeared by the 24th hour: such a swelling could be entirely ignored. Sometimes the reactions in positive animals increased in size after the 72nd hour and might even persist for many months; but occasionally the 72nd hour represented the peak of the reaction and the swelling rapidly retrogressed. He would emphasize, once again, the importance of the second injection, which should not be omitted.

It might be true that animals which had not been tested before gave the best reactions, but it was also certain that previous inoculations of tuberculin would not mask a reaction to a subsequent test. They had found that in a tuberculous animal, the intradermal test could be applied at frequent intervals with a positive result.

There was no objection to the dental type of syringe provided a needle of good length was used. Many practitioners had said, however, that the slender needles supplied with the dental syringe were liable to break and they were compelled to use a needle cut down to 3-5 mm. It was the short needle which he considered was objectionable. He agreed that the interpretation of the test in the bull was not easy.

Votes of thanks.—The President, in moving a vote of thanks to Mr. Glover, said that they were all very pleased that Mr. Glover had been able to come and introduce what had proved to be a most interesting subject. The vote was carried with acclamation. The President also proposed a vote of thanks to those who had supplied the cows for the test, to those who had assisted in obtaining them and particularly to Mr. Sewell, who had performed the *post-mortem* examinations in such a way that it was very easy to see the extent of infection.

A vote of thanks to the President, proposed by Mr. Gofton, concluded the proceedings.

J. N. Ritchie, *Hon. Secretary.*

A HORSE-LEADING "SECRET"

Possibly some of our readers will be unfamiliar with, and grateful for, the following "tip" for leading an unwilling horse (*e.g.*, one difficult to get into a railway box) which, according to *The Farmer and Stockbreeder*, was given by Mr. B. G. Radcliffe to a meeting of Lancashire farmers.

Producing a long piece of rope about the thickness of the domestic clothes line, Mr. Radcliffe stated that he slipped the double end, after the fashion of a crupper, under the dock—a sensitive spot. The rope was then carried along the back and held in position with the surcingle. The ends of the cord were then passed through the halter because he wanted to convey the impression to the horse that he was being led by the head instead of by the tail. He then stood in front and gave a little pull on each end of the rope. This warning was followed by two or three big tugs, and the animal would then come forward.

Some horses had a strong objection to being tied up, and would get their heads out of collars. If the rope were passed under the tail in the manner described and secured to a ring, and the animal were made to back suddenly by throwing some water in his face, he would become aware of the presence of the rope at the sensitive spot, and he would probably be cured for ever.

OWNERSHIP OF CONDEMNED MEAT

Sheffield Corporation win Test Case

A test case presenting aspects of considerable interest to members of the profession engaged in meat inspection work was recently decided in favour of the Corporation in an action brought at the West Riding Assizes at Leeds by W. J. Smeaton and Sons, Ltd., wholesale butchers, of Sheffield, against the Sheffield Corporation, for damages and an injunction.

The action arose out of the seizure of the carcasses of animals rejected by the Corporation veterinary officers, and in delivering judgment Mr. Justice Charles said he had been presented with many difficulties to solve, and he had reached a conclusion which he believed to be a correct conclusion in law, although he had come to it with a good deal of reluctance.

Reviewing the evidence, the Judge recalled that "a sort of arrangement"—he hesitated to call it an agreement—had existed between the butchers of Sheffield and the Corporation that meat condemned at the abattoir under control of the Corporation, should be sold to the latter at 1s. 6d. a cwt., offals not being accounted for in the price.

The Corporation then passed the rejected meat through a machine, and by a process involving high temperature, which was said entirely to eliminate disease, it was reduced to a powder, which had a commercial value and was used for poultry food.

"A period arrived," said his Lordship, "when the butchers were apprised of the fact that two firms were willing to give no less than 4s. a cwt. for the rejected meat, and in the meantime the bidding seems to have risen to 4s. 6d. if offals were included.

"There comes what in my judgment is a somewhat unpleasant feature of the case," continued the Judge.

"The butchers had not unnaturally brought before the Corporation the facts that the latter were buying for 1s. 6d. per cwt. goods which would fetch in the market 4s. or 4s. 6d. Thereafter there ensued a 'somewhat entangled haggling' as to how cheaply the Corporation might buy rejected meat. In the end they put their fee up to 2s. 6d., and that was without prejudice, and for a short time accepted by the butchers. The latter, however, pressed on in an endeavour to get a higher figure, and asked a committee of the Corporation to reconsider their decision as to whether they would not reconsider the price.

"The question was duly and solemnly considered by the Corporation, who said they were going to adhere to their figure of 2s. 6d. for the time, and this again was provisionally accepted by the butchers.

"On October 30th, 1929, however, the Secretary of the Sheffield Wholesale Butchers' Association wrote to the Corporation, and stated that the butchers had entered into an arrangement with two local firms whereby the latter would remove the condemned meat from the abattoir, and adding that they would be able to give adequate guarantees that the food dealt with in that way would not reach the public for human consumption.

"In reply, the Town Clerk of Sheffield wrote that the Corporation could not recognise the arrangement made, and that having regard to the statement in the letter he should be 'bound to advise the Corporation to observe strictly' the relevant section of the Public Health Act of 1875."

It was to be observed, continued his Lordship, that that change was made not in order more adequately to protect the public, because if the price the butchers wanted had been paid by the Corporation that arrangement would have gone on.

After further correspondence, in the course of which the Town Clerk wrote that he had given instructions to the veterinary department to revert to the former practice of dealing with condemned meat and offals, the pertinent sections of the Act were, in accordance with those instructions, strictly enforced, involving the destruction of the condemned meat.

"I think the butchers found themselves in a somewhat difficult position," said the Judge, "and in a position into which they had been misled in some degree by the Corporation themselves because of the arrangement the Corporation saw fit to enter in derogation of their authority under Section 116."

After observing that the Corporation's inspector had acted in accordance with his duty, his Lordship observed: "I say this is a difficult case because I think the butchers, by the arrangement, were rather 'led up the path.'

"But when the Corporation said the arrangement had to stop and that they were going to enforce the section of the Act applicable to the matter in its entirety, they were entitled to do so. In that case there was no conversion and the plaintiffs' action must fail."

It was not necessary, in his judgment, to express a view as to whether the proper remedy, if there was one, was to be found in Section 308 of the same Act, but in his view that section was the proper one to apply to cases which involved wrongful destruction, either because meat was not unsound or for any reason.

SOURCES AND STABILITY OF THE VITAMINS

L. A. Lane (*J. Amer. Med. Ass.*, 1932, 9, 726) quoted by *Pharm. Jour.*, gives a useful summary of the conditions in which vitamins are found and destroyed. Vitamin A is derived from milk, butter, cream, cheese, cod-liver oil, egg yolk, fish-liver oils, liver, kidney, and roe in animal life, and from carrots, cabbage, collards, lettuce, spinach, tomato, bananas, and turnip greens in vegetable life. Prolonged contact in open air or long heating in open vessels destroys vitamin A.

Vitamin B.—Two independent fractions have been demonstrated in vitamin B. B_1 fraction contains the antineuritic property, and B_2 the anti-pellagric. Few foods appear to contain equal amounts of each. Cereals contain more B_1 and little of B_2. White flour has relatively little B complex, as the germ part, which is rich in B_1, is largely lost in milling. Milk and green leafy vegetables are rich in B_2. Bananas have considerable B_2. Yeast contains B_2 and also a fair amount of B_1. Nearly all fruits have vitamin B; also the vegetables. Liver, kidney, oysters, heart, and eggs are good sources of the B complex, probably of the B_2 fraction. Wheat germ is exceptionally rich in B complex. Highly refined foods are poor in B complex. Vitamin B is destroyed by the addition of soda in the cooking. B_1 is destroyed by heat.

Vitamin C.—This vitamin is the most unstable of all the vitamins to heat, especially if heated in the open air. Preserved foods, as a rule, except canned tomatoes, cannot be depended on for vitamin C. Research is making it clear that larger amounts of vitamin C are needed for vigorous health. Sources of vitamin C include oranges, lemons, grapefruit, pineapple, raspberries, and strawberries. Tomatoes are also high in the amount of vitamin C. Cabbage, lettuce, onions,

fresh peas, rutabagas, and spinach contain large amounts. Cereals and meats contain practically none. Milk contains only a small amount. Alkalis, including soda, destroy this vitamin. Ageing and drying lessen the amount of vitamin C. Kohman and Eddy found that if materials prepared for canning were immersed in slightly salted water for a few hours they could be canned without losing vitamin C and the antiscorbutic properties.

Vitamin D.—This is ergosterol, and its value can be increased by irradiation. So far, D is the only vitamin manufactured from a chemical compound. It aids in the metabolism of calcium and phosphorus. Few foods contain vitamin D. Cod-liver oil, liver, and the yolks of eggs contain large amounts. Milk has a little, and green vegetables small amounts.

Vitamin E.—Vitamin E is necessary for fertility, and, according to one authority, appears to be necessary for assimilation of iron. Vitamin E is resistant to heat. It is found in vegetable oils. Wheat embryo furnishes a very potent form. Small amounts are present in meats, milk, and cream. It has been demonstrated that lard and rancid fats are capable of destroying this vitamin.

LONDON VAN HORSE PARADE

Sir J. Moore's Sweepstake Suggestion

"Notwithstanding the growth of mechanical transport the twenty-fourth annual parade of London van horses in Regent's Park yesterday provided a striking demonstration of the popularity of the horse," says *The Times* of Tuesday last. "Thousands of Londoners assembled within the Inner Circle of the park, where they saw horses in pageantry, drawing the coaches of the Lord Mayor and the City Sheriffs, as well as horses used for business purposes. The display was organised by the London Van Horse Parade Society which, since the first parade in 1904, has expended £8,200 in prize money.

"There were 554 entries, compared with 559 last year, and these comprised 493 single-horsed vans and 61 pair-horsed vans. Horses used in the milk trade predominated with 123 entries, and other traders who contributed to the display included general carriers, bakers, butchers, provision merchants and caterers, greengrocers, brewers, whisky distillers, manufacturers of mineral waters, and newsagents. There were also horses and vehicles from the railways and large London stores. Messrs. W. H. Smith and Son, Limited, the newsagents, whose exhibits have always been prominent at the annual parades of the society were, it was stated, represented for the last time. Motor vans are to supersede horse transport in their business.

"The excellence of the turnouts enabled the judges to award 542 first prizes. There were eight second prize winners, and one third. With all first-class awards the Royal Society for the Prevention of Cruelty to Animals gave a brass merit badge. The Lord Mayor of London and the City Sheriffs were present at the parade, and the Lord Mayor and Lady Mayoress presented the prizes.

"A luncheon was afterwards held in the Archers' Hall. Lord Daresbury, the Chairman of the Society, who presided, said the parade had been a great success, and the number of entries had been well maintained. An interesting feature of the parade had been the number of men engaged in small businesses who had taken part. The Society continued to receive support from large firms, but it was in need of funds to enable it to continue the good work that it had done for many years. He proposed the health of the Lord Mayor and Lady Mayoress.

"The Lord Mayor, in reply, said there were certain fundamental necessities which they could not do without, such as bread, milk, and meat, to say nothing of beer and whiskies and sodas—(laughter)—and when seeing the parade he could not help realising that for the purpose of delivering those necessities at their doors the horse van was still the favourite means of transport. He also observed that the horse van was conspicuous in connection with laundries. The Lord Mayor and the Sheriffs demonstrated their loyalty to the horse by being driven in London as often as they could in horse-driven vehicles, and it seemed to him that when they did so a great deal of pleasure was given to the people in the streets.

"Alderman and Sheriff Greenaway proposed the toast of 'The London Van Horse Parade Society.' He said it was interesting to note in these days of motor transport that the horse still held his own. A leading London transport firm, basing its figures on 20 miles a day, showed a light one-horsed vehicle at 17s. 9d. a day; a heavy two-horsed vehicle at 25s. 7d. a day; as compared with a heavy motor lorry at 36s. 6d. a day. Many firms in London were satisfied that for their particular class of work the horse was more economical.

"Lieut.-Colonel P. Laurie replied; and Sir George Hastings proposed 'The Judges, Veterinary Inspectors and Stewards.'

"Major-General Sir John Moore, in reply, said he had been impressed not only by the quality of the horses exhibited, but by the appearance of the turnouts as a whole. The horse was coming back to his own and he was a cheaper form of transportation. The light horse was an essential factor of cavalry, and the breeding of light horses was most important in this country. They heard of sweepstakes, and it grieved him to see the money that was sent to Ireland. If, instead of doing that, they could adopt sweepstakes in this country for the promotion of horse-breeding and other industries connected with the horse they would get as much money as they wanted."

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses:—London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

	Price Net. s.	d.	*Post Free.* s.	d.
Public and General Acts:—				
Ch. 10. Veterinary Surgeons (Irish Free State Agreement)	0	2	0	2½
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Statutory Rules and Orders, 1932:—				
102/S.9. Animal, Scotland. Licensing of Bulls. Order of the Secretary of State, March 9th, 1932	0	1	0	1½
Health, Ministry of:—				
Public Health and Medical Subjects Reports:—				
64. A Report on Tuberculosis, including an Examination of the Results of Sanatorium Treatment. December, 1931. (32-195-64-0)	3	0	3	3

Notes and News

DIARY OF EVENTS

April 4th.—Meeting of the Editorial Committee, N.V.M.A., 2, Verulam Buildings, Gray's Inn, W.C.1, at 4 p.m.

April 5th.—N.V.M.A. Committee Meetings at 2 Verulam Buildings, Gray's Inn, W.C.1: Provisional Committee, 2.30 p.m.; Finance and General Purposes Committee, 4.15 p.m.

April 6th.—R.C.V.S. Registration Committee.

April 7th.—R.C.V.S. Examination, Registration and Parliamentary Committees.

April 8th.—R.C.V.S. Library and Finance Committees; Council Meetings.

April 11th.—N.V.M.A. Committee Meetings, Edinburgh.

April 12th.—N.V.M.A. Council Meeting, Edinburgh.

April 14th.—Meeting of the Central Division, N.V.M.A., at 10, Red Lion Square, W.C.1.

April 15th.—Meeting of the Mid-West and South Wales Division, N.V.M.A., at Bath.

May 5th.—R.C.V.S. Last day for Nominations for election to Council.

May 12th.—D.V.S.M. Examination entries due.

May 19th.—R.C.V.S. Council Election Voting Papers issued.

May 26th.—R.C.V.S. Last day for receipt of Voting Papers.

June 2nd.—R.C.V.S. Annual General Meeting. V.V.B. Fund Annual General Meeting.

June 9th.—D.V.S.M. Written Examination begins.

June 13th.—D.V.S.M. Oral Examination begins.

June 29th.—R.C.V.S. Committee Meetings begin.

June 30th.—R.C.V.S. Annual Dinner.

July 1st.—R.C.V.S. Council Meetings.

July 6th.—R.C.V.S. Summer Examinations begin.

Aug. 8th-13th.—N.V.M.A. Jubilee Congress at Folkestone.

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PERSONAL

Birth.—Cartwright: To Kathleen, wife of W. S. Cartwright, M.R.C.V.S., of Grimsby, a daughter; on March 23rd.

Veterinarian as Sheriff.—We learn from the *Pembroke County and West Wales Guardian* that among the new sheriffs for "the three counties" is Captain A. S. Mathias, M.R.C.V.S., of Llangwarren, Letterston, Pembrokeshire, and, on behalf of his fellow members of the profession, extend him our felicitations upon his appointment to the Shrievalty.

Captain Mathias, who was born in 1885, is the second son of the late Mr. Charles Mathias, of Lamphey Court. He was attached to the 29th Division in time to leave for the first landing at Gallipoli. He is the sixth member of the Mathias family to hold the Shrievalty of Pembrokeshire.

Dr. J. B. Orr, the distinguished director of the Rowett Research Institute, has been nominated a Fellow of the Royal Society—an honour which, throughout the world, signifies the hall-mark of scientific achievement. "This coveted mark of distinction, so well earned and fully merited by Dr. Orr, seldom marks the progress of scientific workers remote from the great scientific centres of Cambridge and London," says an organ of the Agricultural Press.

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R.C.V.S. OBITUARY

Nichols, Herbert Henry, 18, West Street, Oundle, Northants. Graduated London, December 19th, 1895; died March 22nd, 1932; age 60 years.

THE LATE MR. S. H. SLOCOCK

Mr. Sydney Howard Slocock, to whose death we made reference in our last issue, was a native of Wrasbury, Bucks. Educated at Christ's Hospital, he entered the Royal Veterinary College, Camden Town, graduating on March 28th, 1882. Mr. Slocock started to make himself a practice on April 1st following, an endeavour in which he was eminently successful. He was appointed a Local Veterinary Inspector for the County of Middlesex and held this position until his death.

As recorded by us last week, Mr. Slocock was for 20 years a Member of Council of the Royal College and in 1924 was elected President. He was also President, Victoria Veterinary Benevolent Fund for 13 years (1914-1927), while he had served as President of the Central Veterinary Medical Society and of the Royal Counties Veterinary Medical Association. The deceased gentleman was Official Veterinary Adviser to the Kempton Park and Hurst Park Racing Clubs, and in this capacity he was recently a witness in the "Don Pat" doping case.

He had been a sufferer from diabetes for many years and recently became affected with cancer. Mr. Slocock bore his ill-health with heroic fortitude, and although in much pain he stuck to his duties until two days prior to his death, which occurred peacefully in his sleep.

His wife predeceased him by some years—he leaves one son, Major Sydney Slocock, M.C., R.A.V.C., and a daughter married to an officer in the Royal Corps of Signals.

An Appreciation

We feel that the late Mr. Slocock's many friends in the profession will appreciate the opportunity of reading the following tribute, which is from the pen of Mr. Lynwood Palmer, of The White House, Heston, and which appeared in a recent issue of *The Middlesex Chronicle*:—

"It was when first I came here—30 or 35 years ago—that I made the acquaintance of that fine product of British yeoman stock, the veterinary surgeon Sydney Slocock.

"How well I can see him now—riding 15 stone on that little brown blood mare, in his square black hat, black melton tail-coat, and brown breeches and jack-boots, trotting along mile after mile on the daily rounds of his practice. Or perhaps in his dog-cart with a fast-trotting mare,

and probably three or four dogs under the seat. Or again, driving a tandem down the road to Windsor or Virginia Water, with his young son beside him. They would hunt those two horses and then drive them home, probably visiting one or two patients on the way, and so combining business with pleasure, nor thinking anything of rolling off 40 or 50 miles a day.

"In those days he kept in his stable five or six horses, which were in constant use for his practice day and night. It may seem a strange thing to say, but that was almost before the days of the telephone, and a man might come in riding some sort of horse, asking the eminent veterinary surgeon to come out at once as the family cow was ill!

"I myself travel about the country a great deal, and I always found that the name of Sydney Slocock was well known in every circle interested in agriculture and horses. How often have I seen him go off to attend the horse of some poor man whose livelihood probably depended on that beast's health, or to help some other lame dog over a stile—knowing that there was no possibility of a reward! And always his celebrated liniment was a free gift to any poor person that cared to bring a bottle.

"Mr. Slocock was most devoted to his children. His eldest son is a man after his own heart, a good horseman and excellent practitioner, and I think I am right in saying, very popular in the Army, and is now attached to the Cavalry Barracks at Hounslow. Mr. Slocock was himself a fine horseman also, and a fine man to hounds, which of course helped him a great deal in his profession, for if a veterinary surgeon is not that, he must lack a good deal.

"I think back to the days of the Horse Show, with Mr. Slocock and Mr. Luto—both sick men—working as if their own aches and pains went for nothing against those of the patients in the hospital for which they laboured. Alas! we in this district have lost a man, and I have lost a good and noble friend, but it is a comfort to all to know that he will receive his just reward.

"It is a fine thing for a man to leave this world in his three-score years and ten, equally beloved by rich and poor, and when a man dies leaving that sort of reputation behind we can be very certain that human judgment is not at fault."

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PROFESSOR VENNERHOLM

Early in the year the *Svensk Veterinär-Tidskrift* intimated, with the deepest regret, the death of Dr. John Georg Heribert Vennerholm, editor of that publication for no fewer than 36 years, which occurred on December 30th, 1931.

Professor Vennerholm was a former Rector of, and Professor of Surgery in the Veterinary High School, Stockholm, Sweden. Born in 1858, he qualified at the Veterinary Institute in Stockholm in 1882. After spending six years as a district veterinary surgeon he joined the staff of the Veterinary Institute in 1888 and became Professor of Surgery in 1890. The teaching of Obstetrics was combined with this post until 1907. He became Rector of the Veterinary High School in 1915 and retired in 1925.

Dr. Vennerholm's other activities were many and included the presidency of the Swedish Veterinary Medical Association from 1911-1919, and the presidency of the Second Horse Veterinary Congress held in Stockholm in 1921. He was awarded an honorary doctorate by the University of Uppsala in 1907 and a similar recognition by the Veterinary High School in Berlin in 1912. His publications included five books on Equine Surgery, in Swedish and German.

Professor Vennerholm's passing is a very real loss to the veterinary profession in many countries: to Sweden, particularly, where he was justly regarded as one of the most eminent veterinarians of all time.

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ROYAL SANITARY INSTITUTE COUNCIL

The profession will learn with gratification that, at a general meeting of the Royal Sanitary Institute held on March 23rd, Professor G. H. Wooldridge, F.R.C.V.S., M.R.I.A., was elected a member of the Council of that body. The N.V.M.A. will be appreciative of the step thus taken by the Royal Sanitary Institute to meet the wishes of the Association as expressed by resolution of Council, while the general body of the profession will feel itself well represented by Mr. J. R. Hayhurst, who has been a member of Council, R.S.I. for a number of years, and Professor Wooldridge.

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KOCH'S BACILLUS TUBERCULOSIS DISCOVERY JUBILEE

The fiftieth anniversary of Koch's discovery of the tubercle bacillus was commemorated on March 5th at the Robert Koch Institute, Berlin.

Koch's revealing of the tubercle bacillus was more than a triumph of microscopic technique; it was a sociological event of the highest importance to the human race, for in England alone, during the decade that preceded it, the deaths from tuberculosis exceeded those from all other infectious diseases added together. It was on March 24th, 1882, that Robert Koch reported his discovery of the tubercle bacillus to the Berlin Physiological Society. Although the experiments of Villemin, Cohnheim, and Salomonsen had made it clear to most investigators that tuberculosis was an infectious disease, the nature of the infective agent had hitherto been completely unknown.

The discovery of the tubercle bacillus was made at Berlin; Koch stained the organism with alkaline methylene-blue, succeeded in cultivating it and causing the disease by inoculation into healthy animals.

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"POMPEY MEMORIAL KENNELS"

Subscribed by readers of the *Daily Sketch* to perpetuate the memory of Mr. C. B. Poultney's dog "Pompey," the sum of £312 18s. 11d. has been sent to the Royal Veterinary College.

The money will be used to provide Pompey Memorial Kennels in the new college buildings.

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VETERINARY INSPECTION IN KINCARDINESHIRE

At a recent meeting of the Kincardineshire County Council, in reply to a question as to whether or not anything had been done with regard to the appointment of a veterinary surgeon for the county, the Chairman said there was an Aberdeen public health scheme of having one or more whole-time veterinary surgeons for the county. They did not know whether one man would be able to do the whole of the dairy work, but it would be very desirable if they had a whole-time veterinary surgeon of their own.

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FARRIERS OF LONDON AT THE R.V.C.

Farriers of London, to the number of 38, competed recently in the London District Shoeing Championship at the Royal Veterinary College. Many of them were members of the London

Farriery School, and thus represented the most expert of the 1,500 to 2,000 farriers who still carry on their calling in London.

"The making and fitting of horseshoes is one of the industries that have escaped mechanisation," says *The Times*. "It is possible to milk a cow by machinery, but no contrivance seems as yet to have been invented to take the place of the smith with his leather apron, his anvil and his hammer; brawny arms and honest sweat are as much required to-day as they were by the village prototype of the chestnut tree. There is, perhaps, a concession to progress in a 'rotary blower' instead of a bellows, but there is a tendency to look upon even this as 'new fangled.'

"The standard of work, however, is probably higher to-day than it has ever been. Veterinary science has shown that past methods of fitting horseshoes caused cruelty to the animal and loss to the owner. The modern farrier is a highly-skilled craftsman and fashions his shoes with the pride of an expert."

The competitors had to make two shoes, one for the forefoot, to be fitted, and the other for the hind foot, to be left for the inspection of the judge. Points were awarded for the preparation of the hoof, the making and fitting of the shoes, the nailing on and the finishing off. "Four forges were kept going at full blast; anvils rang as the red-hot metal was beaten into shape; and horses stood patiently by, waiting for an old shoe to be stripped off, the hoof pared, and a new iron fitted. Cheerful sparks flew from the anvils and there was a pungent smell of singeing horn as the nearly-completed shoes, still hot, were pressed into position." The competition was continued until well into the afternoon. The number of competitors this year showed an increase over that for 1931.

The prizes were awarded as follows:—First and shield, A. G. Berry, King's Road, Camden Town; 2, John Pomfrey, London Colney, Hertfordshire; 3, R. Lovell, Hammersmith.

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METHODS OF KILLING WILD RABBITS

At a meeting held by the University of London Animal Welfare Society, when methods of catching wild rabbits were discussed, Dr. A. H. B. Kirkman, hon. trapping expert to the Society, read a paper on humane *versus* cruel methods in the capture of wild rabbits. He said his experience taught him that not one in 10 farmers and very few private landowners desired extermination of their rabbits. They could form a rough estimate of the number of rabbits killed annually in the British Isles from the annual tables of the Board of Trade. In 1929 nearly 50,000,000 native-caught rabbit-skins were exported from this country. If they supposed that as many as one skin from every two rabbits killed got into the hands of dealers for export, they would have the result that 100,000,000 rabbits were killed annually in Great Britain; and of these a very substantial proportion were caught with steel traps. These figures meant that every night during the winter months hundreds of thousands of these unfortunate creatures were suffering hours of merciless torture. The Society for which he was speaking was set on the abolition of the steel trap as an unnecessary barbarity, and one which should be relegated to the age of the thumb-screw and the rack.

Describing various methods, he said that the long or poacher's net was by far the most satisfactory means for catching large numbers of depredatory rabbits. Referring to motor-car exhaust gas (containing carbon monoxide), he said that by means of the exhaust from any car, transmitted to holes of warren or hedgerow through a garden hose, all the rabbits, even of the biggest community, could be mercifully and rapidly killed.

Mr. S. E. Harris proposed a resolution stating that the steel trap inflicts extreme cruelty, and that legislation is urgently required to prohibit the use, sale, manufacture, and importation of traps so constructed as to inflict pain by gripping the limbs of an animal.

Lieut.-Colonel T. C. Moore, M.P., said that if something in the nature of a one-clause Bill could be devised, which would arouse the least possible opposition and secure the most support, he would be glad to introduce it.

The resolution was carried.

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FOOT-AND-MOUTH DISEASE RESEARCH

The March issue of the *Journal of the Ministry of Agriculture* contains a useful survey of the position of foot-and-mouth disease research in this country. Following the discovery in Germany 11 years ago that guinea-pigs could be regularly infected with foot-and-mouth disease, it has been practicable to use these animals for much of the experimental work, thus overcoming the inherent difficulties in working with farm animals, which are expensive and need a large space. It is clear from the Research Committee's experiments that the importation of infected meat or offals in a chilled or frozen state is a ready means by which infective material can be brought to this country, and that one common way in which infection is transmitted is by the feeding of scraps of imported meat to pigs. The law requires that all such offals should be boiled before feeding to pigs, but serious trouble has been caused in the past by negligence in this respect. It will be recalled that the outbreak of disease which spread through Northern England and Southern Scotland last summer was attributed to Dutch cauliflowers which found their way on to a farm in Northern Ireland, where the trouble originated. The important point to be borne in mind is that the carcasses of animals which have been killed during the infective period may contain active virus for long periods after they have been subjected to various pickling processes or preserved at low temperatures.

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Errata.—"Our Heraldry": page 292, col. 2 should read Mr. H. M. Barlow, not Harlow, and Sir D'Arcy Power. We are glad to learn that the foot-note request for flcams has borne fruit.

"Pulpy Kidney in Kirkcudbrightshire": page 360, col. 2 read "The fat surrounding the kidneys is frequently injected" (not 'infected'); page 361, col. 1 read "If a ewe loses her lamb or lambs and you twin an orphan to her."

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SUPPOSED EXTINCT MARSUPIAL FOUND

The Adelaide correspondent of *The Times* reports that Mr. Finlayson, curator of the National Museum, has returned from Central Australia, where he rediscovered on the River Diamantina one of the rarest marsupials, named *caloprymnus campestris*, a rat-kangaroo, which was thought to be extinct for nearly a century. The British Museum has the only three specimens in the world. Professor Wood Jones, of Melbourne University, telegraphs that the rediscovery is of great scientific interest. Mr. Finlayson is publishing a description of the animal and its habits.

The passing of the long drought is causing an unprecedented increase of small animals in the interior, including rare species.

The rat-kangaroo or kangaroo rat is the name applied to species of marsupials belonging to several genera. The genus *caloprymnus* has only one species, *campestris*, and was so called because it inhabited plains. It was thought to be confined to South Australia.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

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RECENT LOSSES IN CATTLE IN HEREFORDSHIRE

To the Editor of the Veterinary Record.

Sir,—In the *Veterinary Record* of March 5th, there appears under "Clinical Communications," an article by Mr. Wooff, dealing with recent deaths in cattle in Herefordshire. I am not here concerned with his descriptions of the clinical symptoms, but with the incorrect, and also amazing suggestions he makes regarding the cause of the disease. Mr. Wooff states that examination of the blood has revealed a calcium deficiency. How many cases were examined, and the extent of the deficiency are not mentioned. It may be of interest, therefore, if I state that I have examined the bloods from ten cases which occurred in Herefordshire, and only two showed a lowered calcium, the figures for these being 7·9 mg. and 8·3 mg. per 100 c.c. serum, respectively. I am afraid that Mr. Wooff has not sufficiently differentiated between cases of milk fever, and the condition being discussed, and he has been unfortunate in having only bloods from the former cases examined for calcium.

But it is the latter half of his communication which has prompted me to write you. It is in my opinion unfortunate that the columns of the *Veterinary Record* should be exploited for the publication of such articles. Mr. Wooff states that the symptoms can be explained by an examination of the changes which occur in the blood plasma proteins, but no evidence is given to show that he made any such examination. He then proceeds to write about "dehydration" and "gelation" of the protein particles in the blood, as if these phenomena had been demonstrated. With this surreptitious introduction of a false premise, he continues to play about with these expressions, until he is hopelessly involved. We are entertained to the amazing suggestion that if during the pre-pregnancy stage the "protein particles" are already depleted of water, the *additional withdrawal* of water by micro-organisms results in *more* water being found in the protein particles! Truly, something for nothing. In the preventive treatment there is recommended the administration of some calcium compound, and treacle, because last year's summer has probably caused a deficiency of calcium and sugar. I have already pointed out that a calcium deficiency is not a feature of this disease; and I may now add that in none of the ten cases examined by me was there any evidence of a glucose deficiency in the blood. It may perhaps help us in the assessment of Mr. Wooff's article if it is borne in mind that "gelation" of the "protein particles" in the cerebral blood-vessels is not confined alone to the domestic animals. Mr. Wooff is apparently not entirely to blame, for he states that but for the "help and material" given him by Mr. J. R. Barker, the communication "would not have been possible."

Yours faithfully,

Henry Dryerre.

Animal Diseases Research Association,
Moredun Institute,
Gilmerton,
Edinburgh.

March 14th, 1932.

Diseases of Animals Acts, 1894 to 1927

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
Period 1st to 15th March,	No.	No.	No.	No.	No.	No.	No.	No.	No.
1932	17	23	—	—	8	17	6	97	59
Corresponding period in									
1931	39	40	2	214	15	24	15	56	12
1930	23	24	—	—	11	13	17	104	54
1929	19	19	2	449	12	20	28	55	22
Total 1st January to 15th March, 1932	95	124	1	67	58	104	102	449	193
Corresponding period in									
1931	120	130	4	469	51	88	130	265	97
1930	104	109	—	—	85	132	220	529	202
1929	105	118	19	1,701	92	171	256	257	104

Note.—The figures for the curre nt year are approximate only.